**Supplementary Table 1 |** The amino acid composition of five different diets (g/kg dry weight).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Essential** | **SP0** | **SP5** | **SP10** | **SP15** | **SP20** |
| Arginine (Arg) | 17.41 ± 0.2 | 19.92 ± 0.05 | 20.49 ± 0.06 | 19.74 ± 0.83 | 19.78 ± 0.08 |
| Histidine (His) | 6.98 ± 0.3 | 8.83 ± 1.02 | 7.73 ± 0.15 | 7.32 ± 0.07 | 7.80 ± 0.14 |
| Isoleucine (Ile) | 12.80 ± 0.2 | 13.11 ± 0.77 | 13.39 ± 0.47 | 12.47 ± 0.10 | 12.57 ± 0.22 |
| Leucine (Leu) | 22.21 ± 0.3 | 22.39 ± 0.25 | 22.41 ± 0.04 | 21.56 ± 0.13 | 22.15 ± 0.09 |
| Lysine (Lys) | 20.60 ± 0.1 | 20.93 ± 0.36 | 20.41 ± 0.04 | 19.03 ± 0.40 | 18.72 ± 0.29 |
| Methionine (Met) | 10.94 ± 0.2 | 12.39 ± 0.31 | 12.58 ± 0.1 | 12.02 ± 0.01 | 10.93 ± 0.48 |
| Phenylalanine (Phe) | 14.63 ± 0.03 | 15.27 ± 0.02 | 15.77 ± 0.13 | 14.57 ± 0.15 | 14.28 ± 0.38 |
| Threonine (Thr) | 11.23 ± 0.01 | 14.43 ± 0.24 | 14.33 ± 0.49 | 14.27 ± 0.06 | 14.50 ± 0.23 |
| Tryptophan (Trp) | 1.11 ± 0.01 | 1.47 ± 0.01 | 1.37 ± 0.2 | 1.59 ± 0.02 | 1.59 ± 0.2 |
| Valine (Val) | 13.71 ± 0.05 | 14.67 ± 0.15 | 14.17 ± 0.19 | 14.88 ± 0.06 | 14.04 ± 0.42 |
| **∑Essential** | **131.62 ± 1.68** | **143.41 ± 2.20** | **142.69 ± 0.5** | **137.42 ± 2.3** | **136.25 ± 1.47** |
| **Non-essential** |  |  |  |  |  |
| Alanine (Ala) | 12.40 ± 0.01 | 13.21 ± 0.8 | 12.88 ± 0.01 | 12.58 ± 0.15 | 12.89 ± 0.10 |
| Aspartate (Asp) | 31.31 ± 0.07 | 31.87 ± 0.33 | 31.75 ± 0.21 | 29.63 ± 0.3 | 30.25 ± 0.06 |
| Cysteine (Cys) | 3.51 ± 0.04 | 3.80 ± 0.54 | 2.71 ± 0.16 | 2.36 ± 0.04 | 2.78 ± 0.07 |
| Glutamic Acid (Glu) | 68.41 ± 0.10 | 61.41 ± 0.81 | 61.55 ± 0.68 | 61.61 ± 0.32 | 62.27 ± 0.13 |
| Glycine (Gly) | 11.70 ± 0.2 | 12.54 ± 0.20 | 12.28 ± 0.01 | 11.72 ± 0.10 | 12.89 ± 0.10 |
| Proline (Pro) | 22.46 ± 0.01 | 15.69 ± 0.37 | 15.01 ± 0.05 | 14.88 ± 0.90 | 14.22 ± 0.06 |
| Serine (Ser) | 13.00 ± 0.11 | 14.00 ± 0.07 | 13.34 ± 0.24 | 13.50 ± 0.83 | 12.69 ± 0.06 |
| Tyrosine (Tyr) | 9.02 ± 0.21 | 9.44 ± 0.19 | 8.42 ± 1.36 | 8.84 ± 0.58 | 8.67 ± 0.06 |
| Phosphoserine (p-Ser) | 1.1 ± 0.3 | 1.65 ± 0.04 | 1.02 ± 0.17 | 1.83 ± 0.01 | 1.81 ± 0.28 |
| Taurine (Tau) | 0.35 ± 0.00 | 0.34 ± 0.01 | 0.37 ± 0.09 | 0.39 ± 0.01 | 0.33 ± 0.05 |
| Phospho ethanol amine (PEA) |  | 0.61 ± 0.12  | 0.17 ± 0.00 | 0.72 ± 0.00 |  |
| α-Amino adipic acid (α-AAA) |  | 0.05 ± 0.02 | - | 0.06 ± 0.00 | 0.23 ± 0.15 |
| Cystathionine (Cysthi) | 1.8 ± 0.7 | 1.57 ± 0.02 | 1.26 ± 0.02 | 1.46 ± 0.02 | 1.00 ± 0.4 |
| β-Alanine (β-Ala) | 0.2 ± 0.00 | 2.35 ± 0.36 | 1.79 ± 0.13 | 2.41 ± 0.02 | 2.01 ± 0.00 |
| β Amino isobutyric acid (β-AiBA) | 0.57 ± 0.5 | - | 1.51 ± 0.01 | 2.32 ± 0.1 | 1.49 ± 0.8 |
| ϒ-Amino-n-butyric acid (ϒ-ABA) | 0.31 ± 0.1 | 1.52 ± 0.40 | 1.10 ± 0.01 | 1.55 ± 0.2 | 1.16 ± 0.00 |
| Ethanol amine (EOHNH2) | 3.37 ± 0.12 | 1.30 ± 0.52 | 0.89 ± 0.09 | 1.30 ± 0.41 | 0.89 ± 0.00 |
| Hydroxylysine (Hylys) | 0.1 ± 0.04 | 0.93 ± 0.00 | 0.57 ± 0.00 | 1.33 ± 0.00 | - |
| 1 methyl histidine (1 Mehis) | 0.58 ± 0.3 | 1.29 ± 0.00 | 0.89 ± 0.00 | 2.17 ± 0.66 | 2.55 ± 0.40 |
| Hydroxy proline (Hypro) | 0.65 ± 0.1 | 0.49 ± 0.03 | 0.57 ± 0.15 | 0.56 ± 0.22 | 0.74 ± 0.19 |
| **∑ Non-Essential** | **180.84 ± 1.50** | **174.35 ± 1.00** | **168.67 ± 2.02** | **171.24 ± 7.81** | **168.71 ± 1.91** |

SP0 = Soybean meal only, SP5 = Soybean meal + 5%, *S. polyrhiza*, SP10 = Soybean meal + 10% *S. polyrhiza*, SP15 = Soybean meal + 15% *S. polyrhiza*, SP20 = Soybean meal + 20% *S. polyrhiza*

**Supplementary Table 2 |** Fatty acid composition of five different diets (mg/100 g dry weight).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Fatty acids** | **SP0** | **SP5** | **SP10** | **SP15** | **SP20** |
| 14:0 | 10.44 ± 0.07 | 5.91 ± 0.47 | 9.78 ± 0.86 | 9.40 ± 0.70 | 9.41 ± 0.25 |
| 15:0 | 5.20 ± 0.01 | 0.96 ± 0014 | 1.49 ± 0.10 | 1.83 ± 0.01 | 12.61 ± 0.58 |
| 16:0 | 581.01 ± 8.96 | 580.31 ± 5.78 | 600.05 ± 11.84 | 623.02 ± 7.69 | 619.99 ± 9.18 |
| 18:0 | 70.09 ± 0.99 | 38.84 ± 1.44 | 89.66 ± 3.84 | 88.69 ± 3.19 | 90.21 ± 1.98 |
| 20:0 | 3.26 ± 0.36 | 2.22 ± 0.04 | 5.71 ± 0.40 | 6.24 ± 0.21 | 5.65 ± 0.23 |
| 22:0 | 0.69 ± 0.01 | **-** | - | - | - |
| 24:0 | 15.72 ± 2.77 | 4.86 ± 0.82 | 11.86 ± 1.23 | 8.97 ± 0.46 | 8.46 ± 0.70 |
| **∑SFA** | **686.41 ± 6.43** | **633.10 ± 6.12** | **718.55 ± 8.88** | **738.16 ± 9.52** | **746.33 ± 11.26** |
| 16:1 n-9  | - | 0.02 ± 0.00 | 0.20 ± 0.01 | 0.84± 0.10 | 1.22 ± 0.07 |
| 18:1 n-9  | 1460.56 ± 3.81 | 1470.51 ± 10.68 | 1571.88 ± 8.28 | 1575.55 ± 1.72 | 1481.81 ± 2.88 |
| 20:1 n-9 | 7.86 ± 1.24 | 6.27 ± 0.02 | 6.97 ± 0.81 | 5.38 ± 0.19 | 3.57 ± 0.17 |
| **∑MUFA** | **1468.42 ± 2.57** | **1476.80 ± 10.66** | **1579.06 ± 7.48** | **1581.77 ± 2.01** | **1486.6 ± 2.64** |
| 18:2 n-6  | 3197.60 ± 22.9 | 3130.40 ± 7.24 | 3535.69 ± 3.74 | 3560.45 ± 8.26 | 3307.5 ± 8.34 |
| 20:2 n-6  | 1.09 ± 0.02 | 2.55 ± 0.56 | 1.19 ± 0.09 | 1.21 ± 0.10 | 0.30 ± 0.10 |
| 20:4 n-6  | - | 10.43 ± 0.27 | 0.38 ± 0.03 | 5.83 ± 0.61 | 3.58 ± 0.26 |
| **∑n-6 PUFA** | **3198.7 ± 22.97** | **3143.39 ± 6.42** | **3537.26 ± 3.85** | **3567.49 ± 8.97** | **3311.46 ± 7.98** |
| 18:3 n-3  | 10.98 ± 1.45 | 66.90 ± 1.90 | 83.00 ± 1.37 | 102.34 ± 0.59 | 121.24 ± 0.47 |
| **∑n-3 PUFA** | **10.98 ± 1.45** | **66.90 ± 1.90** | **83.00 ± 1.37** | **102.34 ± 0.59** | **121.24 ± 0.47** |

SP0 = Soybean meal only, SP5 = Soybean meal + 5%, *S. polyrhiza*, SP10 = Soybean meal + 10% *S. polyrhiza*, SP15 = Soybean meal + 15% *S. polyrhiza*, SP20 = Soybean meal + 20% *S. polyrhiza*

**Supplementary Table 3 |** Target genes and sequences of primers used for qPCR analysis.

|  |  |  |  |
| --- | --- | --- | --- |
| **Target gene** | **Primer** | **Primer sequence (5’-3’)** | **Accession number/reference** |
| Delta-6-Desaturase(*Fads2d6*) | Fads2d6 Fw | AGAAATCCGGAGAAATCTGGCT | AF309557 |
| Fads2d6 Rv | ACTGGCGGTTTAGTTGATGTCT |
| Elongation of very long chain fatty acids 2 (*elovl2*) | elovl2 Fw | ATCAGTTTGGTCTGCCGGTT | KR706498 |
| elovl2 Rv | CAGCACAATGAAGATGGTGTCC |
| Elongation of very long chain fatty acids 5 (*elovl5*) | elovl5 Fw | GATTGACGACACTTCGTCCG | KF924199 |
| elovl5 Rv | GAAAGTGTGGCTGCAGTGTG |
| Fatty acid synthase(*fas*) | fas Fw | AATGCTTGGCAGTCCAGAGT | KY378913 |
| fas Rv | AGACACCTGGAACAAGTCCTC |
| *β-actin* | β-actin Fw | AGACATCAGGGTGTCATGGTTGGT | M24113.1 |
| β-actin Rv | CTCAAACATGATCTGTGTCAT |