Supplementary Material

Table 1 Feed formulations for fish meal replacement group

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Ingredient (%)** | **Group1** | **Group2** | **Group3** | **Group4** | **Group5** |
| fish meal | 10 | 5 | 0 | 0 | 0 |
| Soybean meal | 24 | 24 | 24 | 24 | 24 |
| extruded soybean | 0 | 10 | 10 | 0 | 0 |
| rapeseed meal(China) | 10 | 10 | 10 | 10 | 10 |
| rapeseed meal(Canda) | 15 | 15 | 15 | 15 | 15 |
| sunflower seed meal | 9 | 9 | 9 | 9 | 9 |
| cottonseed meal | 0 | 0 | 0 | 10.5 | 0 |
| corn gluten meal | 0 | 0 | 5 | 0 | 10.2 |
| Corn DDGS | 5 | 5 | 5 | 5 | 5 |
| Barley | 7 | 7 | 7 | 7 | 7 |
| Wheat | 4 | 4 | 4 | 4 | 4 |
| Soybean oil | 1.6 | 0 | 0.4 | 2.5 | 2.4 |
| Soybean phospholipid oil | 4 | 4 | 4 | 4 | 4 |
| Calcium dihydrogen phosphate | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Bentonite | 5.4 | 2 | 1.6 | 4 | 4.4 |
| Mineral premixa | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Vitamin premixa | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Total | 100 | 100 | 100 | 100 | 100 |
| Proximate composition (%)b |  |  |  |  |  |
| Crude protein | 32.18 | 32.39 | 32.44 | 32.39 | 32.40 |
| Crude lipid | 8.32 | 8.35 | 8.34 | 8.37 | 8.30 |
| Crude fiber | 6.79 | 7.02 | 6.83 | 6.73 | 6.43 |
| Crude ash | 13.47 | 9.82 | 8.53 | 10.95 | 10.69 |
| a Mineral premix and vitamin premix were purchased from  b The proximate composition of diets was calculated by Excel software based on the data on China feed database (https://www.chinafeeddata.org.cn) | | | | | |

Table 2 Feed formulations for plant protein replacement group

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Ingredient (%)** | **Group4** | **Group5** | **Group6** | **Group7** | **Group8** | **Group9** | **Group10** | **Group11** | **Group12** | **Group13** | **Group14** | **Group15** | **Group16** | **Group17** | **Group18** | **Group19** |
| Soybean meal | 24 | 24 | 16 | 8 | 0 | 24 | 24 | 16 | 8 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| rapeseed meal(China) | 10 | 10 | 10 | 10 | 10 | 10 | 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| rapeseed meal(Canda) | 15 | 15 | 15 | 15 | 15 | 5 | 5 | 15 | 15 | 15 | 13.5 | 11.5 | 0 | 3.75 | 7.5 | 11.25 |
| fermented rapeseed meal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 11.25 | 7.5 | 3.75 |
| sunflower seed meal | 9 | 9 | 9 | 9 | 9 | 19.2 | 29 | 19 | 31 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| cottonseed meal | 10.5 | 0 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| corn gluten meal | 0 | 10.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| peanut meal | 0 | 0 | 7.3 | 14.6 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| corn DDGS | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 2.5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| barley | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| wheat | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 10 | 14 | 4 | 4 | 4 | 4 |
| soybean oil | 2.5 | 2.4 | 2.5 | 2.5 | 2.5 | 2.5 | 2.8 | 2.5 | 2.6 | 2.5 | 1 | 0 | 2.5 | 2.5 | 2.5 | 2.5 |
| Soybean phospholipid oil | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Calcium dihydrogen phosphate | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Bentonite | 4 | 4.4 | 4.7 | 5.4 | 6 | 3.8 | 3.7 | 2 | 0.4 | 4 | 1 | 0 | 4 | 4 | 4 | 4 |
| Mineral premixa | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Vitamin premixaa | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Proximate composition (%)b |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Crude protein | 32.39 | 32.40 | 32.39 | 32.40 | 32.46 | 32.41 | 32.39 | 32.40 | 32.48 | 32.57 | 32.59 | 32.36 | 32.39 | 32.39 | 32.39 | 32.39 |
| Crude lipid | 8.37 | 8.30 | 8.37 | 8.36 | 8.35 | 8.37 | 8.32 | 8.39 | 8.31 | 8.37 | 6.94 | 5.98 | 8.37 | 8.37 | 8.37 | 8.37 |
| Crude fiber | 6.73 | 6.43 | 6.80 | 6.87 | 6.95 | 7.32 | 7.89 | 8.16 | 9.79 | 6.52 | 6.67 | 6.51 | 6.73 | 6.73 | 6.73 | 6.73 |
| Crude ash | 10.95 | 10.69 | 11.61 | 12.27 | 12.84 | 10.63 | 10.37 | 9.14 | 7.67 | 10.95 | 8.22 | 7.25 | 10.95 | 10.95 | 10.95 | 10.95 |
| a Mineral premix and vitamin premix were purchased from  b The proximate composition of diets was calculated by Excel software based on the data on China feed database (https://www.chinafeeddata.org.cn) | | | | | | | | | | | | | | | | |

Table 3 Proximate composition of commercial feed for juvenile fish

|  |  |
| --- | --- |
| Proximate composition (%) |  |
| Crude protein | 32.49 |
| Crude lipid | 7.76 |
| Crude fiber | 8.86 |
| Crude ash | 10.13 |

Figure 1 Weight-length regression analysis of Juvenile fish

