Additional file 1

Additional file 1: Table S1. Allocation of the fish at the start of the experiment.

|  |  |  |  |
| --- | --- | --- | --- |
| **Name of the diet** | Infected | Number of tanks | Total number of fish |
| Control diet | N | 2 | 70 |
| Control diet | Y | 2 | 60 |
| 0.1% β-glucan | Y | 2 | 60 |
| 1.0% β-glucan | Y | 2 | 60 |
| 5.0% β-glucan | Y | 2 | 60 |

Additional file 1: Table S2. Analysis of the composition of the β-glucan used in this study.

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Unit** | **Value** |
| Protein | % | 4.09 |
| Moisture | % | 7.95 |
| Ash | % | 2.53 |
| Fat | % | 4.10 |
| pH (2% sol.) |  | 6.40 |
| Glucan | % | 81.6 |
| Mannan | % | 1.5 |
| Ca | % | 0.08 |
| P | % | 0.09 |
| K | % | 0.07 |
| Na | % | 0.93 |
| Mg | % | 0.07 |
| Cu | mg/kg | 1.45 |
| Fe | mg/kg | 82.99 |
| Mn | mg/kg | 5.58 |
| Zn | mg/kg | 365.74 |
| Co | mg/kg | < 0.50 |
| Mo | mg/kg | < 0.50 |
| Ni | mg/kg | < 0.50 |
| Pb | mg/kg | < 0.50 |
| Cr | mg/kg | 0.6 |
| As | mg/kg | < 0.1 |
| Ba | mg/kg | 2.90 |
| Al | mg/kg | 57.81 |
| Cd | mg/kg | < 0.5 |
| S | % | 0.03 |
|  |  |  |
| Particle Size – Mean | µm | 37.7 |
| Particle Size >10um | % | 91.4 |
| Particle Size >20 um | % | 75.0 |
| Particle Size >50 um | % | 22.9 |
| Particle Size >100 um | % | 4.0 |
| Particle Size >200 um | % | 0.0 |
| Particle Size > 500 um | % | 0.0 |
| Particle Size >1000 um | % | 0.0 |

Additional file 1: Figure S3. Principal component analysis showing the microbiota of the fish at week 6.

Chart

Description automatically generated

Additional file 1: Figure S4. Heatmap showing the 10 most abundant bacterial phyla in the intestine of the fish for the two control groups and the group receiving the three different concentration of β-glucan.

Chart

Description automatically generated

Additional file 1: Table S5. Performance of the fish over the course of the experiment

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Date** | **Days post-infection** | **Treatment** | **Masstotal (g)** | **Lstandard (cm)** | **Ltotal (cm)** | **Fulton's condition factor (*K*)** | **Mean *K*** | **Mean masstotal (g)** |
| Week 0 | - | 0% β-glucan | 19.3 | 11.1 | 12.3 | 1.41 |  |  |
| Week 0 | - | 0% β-glucan | 14.5 | 9.7 | 11.0 | 1.59 |  |  |
| Week 0 | - | 0% β-glucan | 13.7 | 9.3 | 11.0 | 1.70 |  |  |
| Week 0 | - | 0% β-glucan | 15.8 | 10.3 | 11.1 | 1.45 |  |  |
| Week 0 | - | 0% β-glucan | 13.2 | 9.6 | 10.7 | 1.49 |  |  |
| Week 0 | - | 0% β-glucan | 19.3 | 11.1 | 12.2 | 1.41 |  |  |
| Week 0 | - | 0% β-glucan | 9.1 | 8.4 | 9.3 | 1.54 |  |  |
| Week 0 | - | 0% β-glucan | 20.6 | 11.1 | 12.4 | 1.51 |  |  |
| Week 0 | - | 0% β-glucan | 15.1 | 9.8 | 10.9 | 1.60 |  |  |
| Week 0 | - | 0% β-glucan | 14.5 | 9.8 | 10.9 | 1.54 | **1.52** | **15.51** |
|  |  |  |  |  |  |  |  |  |
| Week 3 | - | 0% β-glucan | 19.5 | - | - | - |  |  |
| Week 3 | - | 0% β-glucan | 19.0 | - | - | - |  |  |
| Week 3 | - | 0% β-glucan | 21.5 | - | - | - |  |  |
| Week 3 | - | 0% β-glucan | 22.0 | - | - | - |  |  |
| Week 3 | - | 0% β-glucan | 17.0 | - | - | - |  |  |
| Week 3 | - | 0% β-glucan | 20.5 | - | - | - |  |  |
| Week 3 | - | 0% β-glucan | 15.5 | - | - | - |  |  |
| Week 3 | - | 0% β-glucan | 12.5 | - | - | - |  |  |
| Week 3 | - | 0% β-glucan | 25.5 | - | - | - |  |  |
| Week 3 | - | 0% β-glucan | 12.5 | - | - | - |  | **18.6** |
| Week 3 | - | 0.1% β-glucan | 15.0 | - | - | - |  |  |
| Week 3 | - | 0.1% β-glucan | 21.0 | - | - | - |  |  |
| Week 3 | - | 0.1% β-glucan | 20.5 | - | - | - |  |  |
| Week 3 | - | 0.1% β-glucan | 19.5 | - | - | - |  |  |
| Week 3 | - | 0.1% β-glucan | 13.5 | - | - | - |  |  |
| Week 3 | - | 0.1% β-glucan | - | - | - | - |  |  |
| Week 3 | - | 0.1% β-glucan | 16.5 | - | - | - |  |  |
| Week 3 | - | 0.1% β-glucan | 19.5 | - | - | - |  |  |
| Week 3 | - | 0.1% β-glucan | 33.0 | - | - | - |  |  |
| Week 3 | - | 0.1% β-glucan | 17.5 | - | - | - |  | **19.6** |
| Week 3 | - | 1.0% β-glucan | 21.0 | - | - | - |  |  |
| Week 3 | - | 1.0% β-glucan | 22.5 | - | - | - |  |  |
| Week 3 | - | 1.0% β-glucan | 15.0 | - | - | - |  |  |
| Week 3 | - | 1.0% β-glucan | - | - | - | - |  |  |
| Week 3 | - | 1.0% β-glucan | - | - | - | - |  |  |
| Week 3 | - | 1.0% β-glucan | 17.5 | - | - | - |  |  |
| Week 3 | - | 1.0% β-glucan | - | - | - | - |  |  |
| Week 3 | - | 1.0% β-glucan | 15.5 | - | - | - |  |  |
| Week 3 | - | 1.0% β-glucan | 27.5 | - | - | - |  |  |
| Week 3 | - | 1.0% β-glucan | 20.0 | - | - | - |  | **19.9** |
| Week 3 | - | 5.0% β-glucan | 15.0 | - | - | - |  |  |
| Week 3 | - | 5.0% β-glucan | 20.0 | - | - | - |  |  |
| Week 3 | - | 5.0% β-glucan | 18.0 | - | - | - |  |  |
| Week 3 | - | 5.0% β-glucan | 22.0 | - | - | - |  |  |
| Week 3 | - | 5.0% β-glucan | 13.0 | - | - | - |  |  |
| Week 3 | - | 5.0% β-glucan | 29.0 | - | - | - |  |  |
| Week 3 | - | 5.0% β-glucan | 14.0 | - | - | - |  |  |
| Week 3 | - | 5.0% β-glucan | 12.5 | - | - | - |  |  |
| Week 3 | - | 5.0% β-glucan | 20.5 | - | - | - |  |  |
| Week 3 | - | 5.0% β-glucan | 19.5 | - | - | - |  | **18.4** |
|  |  |  |  |  |  |  |  |  |
| Week 6 | 0 | 0% β-glucan | 27.0 | 11.8 | 13.1 | 1.64 |  |  |
| Week 6 | 0 | 0% β-glucan | 24.5 | 12.4 | 13.1 | 1.28 |  |  |
| Week 6 | 0 | 0% β-glucan | 17.5 | 10.7 | 12.0 | 1.43 |  |  |
| Week 6 | 0 | 0% β-glucan | 16.5 | 10.3 | 11.4 | 1.51 |  |  |
| Week 6 | 0 | 0% β-glucan | 24.5 | 12.2 | 13.0 | 1.35 |  |  |
| Week 6 | 0 | 0% β-glucan | 32.0 | 13.3 | 14.6 | 1.36 |  |  |
| Week 6 | 0 | 0% β-glucan | 18.0 | 10.6 | 11.9 | 1.51 |  |  |
| Week 6 | 0 | 0% β-glucan | 21.0 | 11.2 | 12.6 | 1.49 |  |  |
| Week 6 | 0 | 0% β-glucan | 28.5 | 12.9 | 14.2 | 1.33 |  |  |
| Week 6 | 0 | 0% β-glucan | 14.5 | 9.8 | 10.9 | 1.54 | **1.45** | **22.4** |
| Week 6 | 0 | 0.1% β-glucan | 18.0 | 10.7 | 11.9 | 1.47 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 23.5 | 11.4 | 12.5 | 1.59 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 19.0 | 10.9 | 12.1 | 1.47 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 26.0 | 12.4 | 13.6 | 1.36 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 20.0 | 11.0 | 12.1 | 1.50 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 14.5 | 10.0 | 11.2 | 1.45 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 14.5 | 9.5 | 10.6 | 1.69 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 23.0 | 12.0 | 13.3 | 1.33 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 30.5 | 12.5 | 13.7 | 1.56 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 15.0 | 10.0 | 11.2 | 1.50 | **1.49** | **20.4** |
| Week 6 | 0 | 1.0% β-glucan | 17.0 | 10.5 | 11.6 | 1.47 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 16.0 | 9.5 | 10.7 | 1.87 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 22.0 | 11.4 | 12.8 | 1.48 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 17.5 | 10.5 | 11.5 | 1.51 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 22.5 | 11.5 | 12.6 | 1.48 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 30.5 | 12.8 | 14.2 | 1.45 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 25.0 | 11.8 | 13.4 | 1.52 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 31.5 | 13.1 | 14.5 | 1.40 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 22.5 | 11.8 | 13.1 | 1.37 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 13.0 | 9.4 | 10.6 | 1.57 | **1.51** | **21.8** |
| Week 6 | 0 | 5.0% β-glucan | 30.5 | 13.2 | 14.5 | 1.33 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 29.0 | 13.0 | 14.4 | 1.32 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 19.0 | 10.7 | 11.9 | 1.55 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 17.0 | 10.4 | 11.6 | 1.51 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 30.5 | 13.0 | 14.2 | 1.39 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 23.5 | 11.7 | 12.7 | 1.47 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 13.5 | 9.6 | 10.8 | 1.53 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 17.5 | 10.7 | 11.7 | 1.43 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 20.5 | 11.3 | 12.6 | 1.42 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 13.0 | 9.9 | 10.9 | 1.34 | **1.43** | **21.4** |
|  |  |  |  |  |  |  |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 30.5 | 13.3 | 14.8 | 1.30 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 22.5 | 11.3 | 12.1 | 1.56 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 20.5 | 11.4 | 12.7 | 1.38 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 32.0 | 13.0 | 14.4 | 1.46 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 17.5 | 10.0 | 11.7 | 1.75 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 22.0 | 11.0 | 12.4 | 1.65 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 25.5 | 12.0 | 13.4 | 1.48 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 24.5 | 12.0 | 13.4 | 1.42 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 23.5 | 11.4 | 12.7 | 1.59 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 34.5 | 12.8 | 14.1 | 1.65 | **1.52** | **25.3** |
| Week 6 | 0 | 0% β-glucan | 24.0 | 11.9 | 13.2 | 1.42 |  |  |
| Week 6 | 0 | 0% β-glucan | 18.5 | 11.2 | 12.5 | 1.32 |  |  |
| Week 6 | 0 | 0% β-glucan | 18.0 | - | - | - |  |  |
| Week 6 | 0 | 0% β-glucan | 26.5 | 12.4 | 13.6 | 1.39 |  |  |
| Week 6 | 0 | 0% β-glucan | 26.5 | 12.3 | 13.5 | 1.42 |  |  |
| Week 6 | 0 | 0% β-glucan | 17.0 | 10.7 | 11.1 | 1.39 |  |  |
| Week 6 | 0 | 0% β-glucan | 27.5 | 13.0 | 14.4 | 1.25 |  |  |
| Week 6 | 0 | 0% β-glucan | 25.5 | 11.8 | 13.1 | 1.55 |  |  |
| Week 6 | 0 | 0% β-glucan | 14.0 | 9.5 | 10.5 | 1.63 |  |  |
| Week 6 | 0 | 0% β-glucan | 13.5 | 9.7 | 10.8 | 1.48 | **1.43** | **21.1** |
| Week 6 | 0 | 0.1% β-glucan | 38.5 | 13.5 | 14.9 | 1.56 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 22.0 | 11.5 | 12.8 | 1.45 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 23.5 | 11.7 | 13.1 | 1.47 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 16.0 | 10.0 | 11.2 | 1.60 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 14.0 | 9.9 | 10.9 | 1.44 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 21.5 | 11.7 | 12.9 | 1.34 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 22.5 | 11.1 | 12.3 | 1.65 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 36.0 | 13.6 | 15.1 | 1.43 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 22.0 | 11.9 | 13.2 | 1.31 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 30.5 | 12.7 | 14.1 | 1.49 | **1.47** | **24.7** |
| Week 6 | 0 | 1.0% β-glucan | 15.5 | 10.2 | 11.5 | 1.46 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 26.0 | 11.9 | 13.1 | 1.54 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 36.5 | 14.0 | 15.4 | 1.33 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 18.0 | 11.0 | 12.2 | 1.35 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 24.0 | 11.5 | 12.9 | 1.58 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 25.0 | 12.2 | 13.1 | 1.38 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 24.5 | 12.0 | 13.2 | 1.42 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 24.5 | 12.1 | 13.4 | 1.38 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 15.0 | 10.1 | 11.3 | 1.46 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 21.0 | 11.2 | 12.4 | 1.49 | **1.44** | **23.0** |
| Week 6 | 0 | 5.0% β-glucan | 15.0 | 9.8 | 11.0 | 1.59 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 17.5 | 10.6 | 11.9 | 1.47 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 14.0 | 10.3 | 11.6 | 1.28 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 28.0 | 13.0 | 14.2 | 1.27 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 22.0 | 11.9 | 13.1 | 1.31 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 16.0 | 10.4 | 11.5 | 1.42 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 19.5 | 11.0 | 12.2 | 1.47 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 23.0 | 11.8 | 13.0 | 1.40 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 27.5 | 12.5 | 13.8 | 1.41 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 38.5 | 13.6 | 15.0 | 1.53 | **1.42** | **22.1** |
| Week 6 |  |  |  |  |  |  |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 26.5 | 12.2 | 13.5 | 1.46 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 31.5 | 13.0 | 14.2 | 1.43 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 21.0 | 11.2 | 12.6 | 1.49 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 29.5 | 12.6 | 14.1 | 1.47 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 21.0 | 11.6 | 13.0 | 1.35 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 23.0 | 11.6 | 12.8 | 1.47 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 17.0 | 10.2 | 11.3 | 1.60 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 22.0 | 11.1 | 12.5 | 1.61 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 26.0 | 12.3 | 13.6 | 1.40 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 37.0 | 13.9 | 15.4 | 1.38 | **1.47** | **25.5** |
| Week 6 | 0 | 0% β-glucan | 17.5 | 10.5 | 11.7 | 1.51 |  |  |
| Week 6 | 0 | 0% β-glucan | 22.0 | 11.3 | 12.3 | 1.52 |  |  |
| Week 6 | 0 | 0% β-glucan | 33.0 | 13.3 | 14.7 | 1.40 |  |  |
| Week 6 | 0 | 0% β-glucan | 27.0 | 12.5 | 14.0 | 1.38 |  |  |
| Week 6 | 0 | 0% β-glucan | 30.5 | - | - | - |  |  |
| Week 6 | 0 | 0% β-glucan | 19.0 | 10.8 | 11.9 | 1.51 |  |  |
| Week 6 | 0 | 0% β-glucan | 36.0 | 14.1 | 15.6 | 1.28 |  |  |
| Week 6 | 0 | 0% β-glucan | 21.5 | 11.4 | 12.7 | 1.45 |  |  |
| Week 6 | 0 | 0% β-glucan | 23.5 | 12.3 | 13.7 | 1.26 |  |  |
| Week 6 | 0 | 0% β-glucan | 19.0 | 10.8 | 12.0 | 1.51 | **1.43** | **24.9** |
| Week 6 | 0 | 0.1% β-glucan | 24.0 | 11.7 | 13.0 | 1.50 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 29.5 | 12.5 | 13.7 | 1.51 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 23.0 | 11.7 | 13.0 | 1.44 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 20.5 | 11.5 | 12.8 | 1.35 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 20.5 | 10.9 | 11.9 | 1.58 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 31.0 | 12.8 | 13.8 | 1.48 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 13.5 | 9.5 | 10.5 | 1.57 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 16.0 | 10.3 | 11.5 | 1.46 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 21.5 | 11.5 | 13.0 | 1.41 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 15.0 | 10.4 | 11.5 | 1.33 | **1.46** | **21.5** |
| Week 6 | 0 | 1.0% β-glucan | 18.0 | 10.4 | 11.8 | 1.60 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 29.0 | 12.5 | 13.8 | 1.48 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 21.5 | 10.5 | 11.8 | 1.86 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 21.0 | 11.2 | 12.5 | 1.49 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 25.0 | 12.3 | 13.6 | 1.34 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 25.0 | 12.2 | 13.4 | 1.38 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 15.5 | 10.1 | 11.2 | 1.50 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 25.0 | 12.4 | 13.8 | 1.31 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 21.0 | 11.4 | 12.7 | 1.42 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 24.5 | 12.3 | 13.2 | 1.32 | **1.47** | **22.6** |
| Week 6 | 0 | 5.0% β-glucan | 37.0 | 13.7 | 15.0 | 1.44 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 21.5 | 11.3 | 12.5 | 1.49 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 22.5 | 11.8 | 13.1 | 1.37 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 13.5 | 10.0 | 11.2 | 1.35 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 17.0 | 10.4 | 11.7 | 1.51 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 16.5 | 10.2 | 11.3 | 1.55 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 25.0 | 11.7 | 13.0 | 1.56 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 26.5 | 12.2 | 13.4 | 1.46 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 33.5 | 12.9 | 14.3 | 1.56 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 15.0 | 9.7 | 10.9 | 1.64 | **1.49** | **22.8** |
| Week 6 |  |  |  |  |  |  |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 28.5 | 12.2 | 13.5 | 1.57 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 16.5 | 10.4 | 11.6 | 1.47 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 25.5 | 11.8 | 13.3 | 1.55 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 20.0 | 11.0 | 12.3 | 1.50 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 24.0 | 11.7 | 12.8 | 1.50 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 17.5 | 10.5 | 11.7 | 1.51 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 16.0 | 9.7 | 11.0 | 1.75 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 26.0 | 12.1 | 13.5 | 1.47 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 20.0 | 10.9 | 12.1 | 1.54 |  |  |
| Week 6 | 0 | 0% β-glucan (uninfected control) | 20.0 | 10.4 | 11.5 | 1.78 | **1.56** | **21.4** |
| Week 6 | 0 | 0% β-glucan | 27.5 | 12.5 | 13.7 | 1.41 |  |  |
| Week 6 | 0 | 0% β-glucan | 23.0 | 11.9 | 13.4 | 1.36 |  |  |
| Week 6 | 0 | 0% β-glucan | 22.5 | 11.7 | 13.0 | 1.40 |  |  |
| Week 6 | 0 | 0% β-glucan | 32.0 | 13.0 | 14.3 | 1.46 |  |  |
| Week 6 | 0 | 0% β-glucan | 23.0 | 11.9 | 13.2 | 1.36 |  |  |
| Week 6 | 0 | 0% β-glucan | 35.0 | 13.5 | 14.8 | 1.42 |  |  |
| Week 6 | 0 | 0% β-glucan | 26.5 | 12.4 | 13.6 | 1.39 |  |  |
| Week 6 | 0 | 0% β-glucan | 28.0 | 12.5 | 13.7 | 1.43 |  |  |
| Week 6 | 0 | 0% β-glucan | 21.5 | 11.5 | 12.9 | 1.41 |  |  |
| Week 6 | 0 | 0% β-glucan | 26.5 | 12.5 | 13.8 | 1.36 | **1.40** | **26.6** |
| Week 6 | 0 | 0.1% β-glucan | 29.5 | 12.8 | 14.1 | 1.41 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 18.0 | 10.6 | 11.7 | 1.51 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 25.0 | 12.1 | 13.3 | 1.41 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 18.0 | 10.3 | 11.5 | 1.65 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 17.0 | 10.2 | 11.8 | 1.60 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 16.0 | 10.0 | 11.3 | 1.60 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 30.0 | 12.8 | 14.1 | 1.43 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 21.0 | 11.1 | 12.1 | 1.54 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 28.5 | 12.5 | 13.9 | 1.46 |  |  |
| Week 6 | 0 | 0.1% β-glucan | 25.5 | 12.5 | 13.8 | 1.31 | **1.49** | **22.9** |
| Week 6 | 0 | 1.0% β-glucan | 24.5 | 11.9 | 13.0 | 1.45 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 16.0 | 10.0 | 11.2 | 1.60 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 22.5 | 11.7 | 12.9 | 1.40 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 13.5 | 9.8 | 10.9 | 1.43 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 22.5 | 11.5 | 12.7 | 1.48 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 34.5 | 13.6 | 15.0 | 1.37 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 15.5 | 10.2 | 11.4 | 1.46 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 32.5 | 13.6 | 14.8 | 1.29 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 26.0 | 12.2 | 13.5 | 1.43 |  |  |
| Week 6 | 0 | 1.0% β-glucan | 32.0 | 12.9 | 14.2 | 1.49 | **1.44** | **24.0** |
| Week 6 | 0 | 5.0% β-glucan | 17.0 | 10.6 | 11.8 | 1.43 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 24.0 | 11.7 | 13.0 | 1.50 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 24.0 | 11.6 | 12.9 | 1.54 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 15.5 | 10.1 | 11.3 | 1.50 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 25.5 | 12.0 | 13.1 | 1.48 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 24.0 | 12.0 | 13.4 | 1.39 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 32.5 | 13.3 | 14.5 | 1.38 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 28.5 | 12.2 | 13.4 | 1.57 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 18.5 | 10.8 | 12.1 | 1.47 |  |  |
| Week 6 | 0 | 5.0% β-glucan | 32.0 | 13.0 | 14.7 | 1.46 | **1.47** | **24.2** |
|  |  |  |  |  |  |  |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 18.5 | 10.8 | 12.1 | 1.47 |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 24.5 | 11.9 | 13.0 | 1.45 |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 18.0 | 10.8 | 11.9 | 1.43 |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 32.5 | 13.1 | 14.5 | 1.45 |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 17.5 | 10.0 | 11.3 | 1.75 |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 30.5 | 12.5 | 13.7 | 1.56 |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 25.0 | 11.8 | 13.2 | 1.52 |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 17.5 | 10.1 | 11.2 | 1.70 |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 23.5 | 11.2 | 12.6 | 1.67 |  |  |
| Week 8 | 14 | 0% β-glucan (uninfected control) | 22.5 | 11.3 | 12.5 | 1.56 | **1.56** | **23.0** |
| Week 8 | 14 | 0% β-glucan | 30.5 | 12.8 | 14.0 | 1.45 |  |  |
| Week 8 | 14 | 0% β-glucan | 31.5 | 12.9 | 14.2 | 1.47 |  |  |
| Week 8 | 14 | 0% β-glucan | 42.5 | 14.6 | 15.8 | 1.37 |  |  |
| Week 8 | 14 | 0% β-glucan | 22.5 | 11.7 | 12.7 | 1.40 |  |  |
| Week 8 | 14 | 0% β-glucan | 32.5 | 13.3 | 14.7 | 1.38 |  |  |
| Week 8 | 14 | 0% β-glucan | 30.0 | 12.6 | 13.8 | 1.50 |  |  |
| Week 8 | 14 | 0% β-glucan | 37.5 | 13.7 | 14.9 | 1.46 |  |  |
| Week 8 | 14 | 0% β-glucan | 26.0 | 12.6 | 14.0 | 1.30 |  |  |
| Week 8 | 14 | 0% β-glucan | 27.0 | 12.4 | 13.6 | 1.42 |  |  |
| Week 8 | 14 | 0% β-glucan | 19.5 | 11.1 | 12.2 | 1.43 |  |  |
| Week 8 | 14 | 0% β-glucan | 36.5 | 13.2 | 14.5 | 1.59 |  |  |
| Week 8 | 14 | 0% β-glucan | 29.5 | 13.0 | 14.5 | 1.34 |  |  |
| Week 8 | 14 | 0% β-glucan | 18.5 | 10.4 | 11.6 | 1.64 |  |  |
| Week 8 | 14 | 0% β-glucan | 16.5 | 10.2 | 11.4 | 1.55 |  |  |
| Week 8 | 14 | 0% β-glucan | 29.0 | 12.7 | 14.0 | 1.42 |  |  |
| Week 8 | 14 | 0% β-glucan | 19.0 | 10.8 | 12.1 | 1.51 |  |  |
| Week 8 | 14 | 0% β-glucan | 19.5 | 11.0 | 12.2 | 1.47 |  |  |
| Week 8 | 14 | 0% β-glucan | 28.0 | 12.5 | 13.6 | 1.43 |  |  |
| Week 8 | 14 | 0% β-glucan | 29.5 | 12.9 | 14.2 | 1.37 |  |  |
| Week 8 | 14 | 0% β-glucan | 30.5 | 12.7 | 14.1 | 1.49 | **1.45** | **27.8** |
| Week 8 | 14 | 0.1% β-glucan | 49.0 | 14.5 | 16.0 | 1.61 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 23.0 | 11.7 | 12.8 | 1.44 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 26.5 | 12.1 | 13.4 | 1.50 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 18.5 | 11.0 | 12.2 | 1.39 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 18.5 | 10.5 | 11.8 | 1.60 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 32.5 | 13.3 | 14.3 | 1.38 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 40.5 | 14.1 | 15.4 | 1.44 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 22.0 | 11.7 | 12.9 | 1.37 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 17.5 | 10.4 | 11.6 | 1.56 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 14.0 | 10.0 | 11.2 | 1.40 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 22.5 | 11.7 | 12.9 | 1.40 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 17.0 | 10.5 | 11.8 | 1.47 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 30.0 | 12.5 | 14.0 | 1.54 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 29.0 | 12.8 | 13.9 | 1.38 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 21.5 | 11.5 | 12.7 | 1.41 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 26.0 | 12.1 | 13.3 | 1.47 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 25.5 | 12.2 | 13.5 | 1.40 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 39.5 | 13.4 | 14.7 | 1.64 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 14.5 | 9.9 | 11.0 | 1.49 |  |  |
| Week 8 | 14 | 0.1% β-glucan | 17.5 | 10.5 | 11.7 | 1.51 | **1.47** | **25.3** |
| Week 8 | 14 | 1.0% β-glucan | 21.0 | 11.0 | 12.2 | 1.58 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 22.0 | 11.3 | 12.5 | 1.52 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 34.0 | 13.4 | 14.3 | 1.41 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 29.5 | 12.7 | 14.0 | 1.44 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 25.5 | 11.8 | 12.8 | 1.55 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 38.5 | 14.6 | 15.9 | 1.24 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 26.0 | 12.2 | 13.3 | 1.43 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 31.5 | 13.5 | 14.6 | 1.28 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 17.5 | 10.5 | 11.7 | 1.51 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 21.5 | 11.2 | 12.3 | 1.53 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 18.0 | 10.8 | 12.0 | 1.43 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 25.0 | 12.2 | 13.5 | 1.38 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 31.5 | 12.7 | 13.7 | 1.54 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 22.5 | 11.3 | 12.6 | 1.56 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 36.0 | 13.6 | 15.0 | 1.43 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 17.0 | 10.6 | 11.9 | 1.43 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 20.0 | 11.2 | 12.4 | 1.42 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 39.5 | 14.5 | 16.0 | 1.30 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 29.5 | 12.9 | 14.1 | 1.37 |  |  |
| Week 8 | 14 | 1.0% β-glucan | 21.0 | 11.4 | 12.7 | 1.42 | **1.44** | **26.4** |
| Week 8 | 14 | 5.0% β-glucan | 24.0 | 11.9 | 13.1 | 1.42 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 21.5 | 11.5 | 12.7 | 1.41 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 27.5 | 12.3 | 13.8 | 1.48 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 37.0 | 13.7 | 15.2 | 1.44 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 18.5 | 10.9 | 11.9 | 1.43 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 35.0 | 14.2 | 15.6 | 1.22 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 39.5 | 14.0 | 15.4 | 1.44 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 31.0 | 13.4 | 14.8 | 1.29 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 24.0 | 11.8 | 13.1 | 1.46 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 20.0 | 11.3 | 12.6 | 1.39 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 24.5 | 12.2 | 13.5 | 1.35 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 22.0 | 11.3 | 12.6 | 1.52 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 27.0 | 12.3 | 13.5 | 1.45 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 27.5 | 12.6 | 14.0 | 1.37 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 17.0 | 10.5 | 11.6 | 1.47 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 18.0 | 10.7 | 12.0 | 1.47 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 24.5 | 12.0 | 13.5 | 1.42 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 16.5 | 10.3 | 11.6 | 1.51 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 18.0 | 10.7 | 11.9 | 1.47 |  |  |
| Week 8 | 14 | 5.0% β-glucan | 19.5 | 11.2 | 12.4 | 1.39 | **1.42** | **24.6** |
|  |  |  |  |  |  |  |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 20.0 | 10.5 | 11.6 | 1.73 |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 21.0 | 10.5 | 11.8 | 1.81 |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 19.0 | 10.5 | 11.2 | 1.64 |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 30.0 | 12.6 | 13.8 | 1.50 |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 28.0 | 12.5 | 13.9 | 1.43 |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 24.5 | 11.2 | 13.0 | 1.74 |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 45.5 | 14.4 | 15.8 | 1.52 |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 24.0 | 11.4 | 12.7 | 1.62 |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 29.5 | 12.9 | 14.3 | 1.37 |  |  |
| Week 9 | 21 | 0% β-glucan (uninfected control) | 25.5 | 12.0 | 13.4 | 1.48 | **1.59** | **26.7** |
| Week 9 | 21 | 0% β-glucan | 21.5 | 11.0 | 12.2 | 1.62 |  |  |
| Week 9 | 21 | 0% β-glucan | 25.0 | 12.2 | 13.5 | 1.38 |  |  |
| Week 9 | 21 | 0% β-glucan | 26.0 | 12.7 | 13.8 | 1.27 |  |  |
| Week 9 | 21 | 0% β-glucan | 23.0 | 11.5 | 12.9 | 1.51 |  |  |
| Week 9 | 21 | 0% β-glucan | 25.5 | 12.0 | 13.2 | 1.48 |  |  |
| Week 9 | 21 | 0% β-glucan | 37.5 | 13.5 | 15.0 | 1.52 |  |  |
| Week 9 | 21 | 0% β-glucan | 30.0 | 13.1 | 14.0 | 1.33 |  |  |
| Week 9 | 21 | 0% β-glucan | 33.5 | 13.0 | 14.4 | 1.52 |  |  |
| Week 9 | 21 | 0% β-glucan | 28.5 | 12.6 | 13.5 | 1.42 |  |  |
| Week 9 | 21 | 0% β-glucan | 27.0 | 12.4 | 13.8 | 1.42 |  |  |
| Week 9 | 21 | 0% β-glucan | 29.0 | 12.7 | 14.0 | 1.42 |  |  |
| Week 9 | 21 | 0% β-glucan | 25.0 | 11.9 | 13.2 | 1.48 |  |  |
| Week 9 | 21 | 0% β-glucan | 35.5 | 13.3 | 14.6 | 1.51 |  |  |
| Week 9 | 21 | 0% β-glucan | 53.5 | 15.5 | 16.8 | 1.44 |  |  |
| Week 9 | 21 | 0% β-glucan | 25.0 | 11.7 | 12.9 | 1.56 |  |  |
| Week 9 | 21 | 0% β-glucan | 36.0 | 14.0 | 15.5 | 1.31 |  |  |
| Week 9 | 21 | 0% β-glucan | 32.0 | 13.2 | 14.5 | 1.39 |  |  |
| Week 9 | 21 | 0% β-glucan | 37.5 | 14.0 | 15.5 | 1.37 |  |  |
| Week 9 | 21 | 0% β-glucan | 24.0 | 11.0 | 12.6 | 1.80 |  |  |
| Week 9 | 21 | 0% β-glucan | 19.0 | 10.4 | 11.5 | 1.69 | **1.47** | **29.7** |
| Week 9 | 21 | 0.1% β-glucan | 28.5 | 12.3 | 13.6 | 1.53 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 32.5 | 12.8 | 14.0 | 1.55 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 19.0 | 10.6 | 12.1 | 1.60 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 19.5 | 10.5 | 11.9 | 1.68 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 31.0 | 12.5 | 13.6 | 1.59 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 22.0 | 11.5 | 12.6 | 1.45 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 39.5 | 13.5 | 15.0 | 1.61 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 45.0 | 14.4 | 15.6 | 1.51 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 25.5 | 11.7 | 13.0 | 1.59 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 18.5 | 10.5 | 11.9 | 1.60 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 25.0 | 11.4 | 12.5 | 1.69 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 19.0 | 10.3 | 11.3 | 1.74 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 21.5 | 11.2 | 12.4 | 1.53 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 31.5 | 12.9 | 14.1 | 1.47 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 28.0 | 12.1 | 13.4 | 1.58 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 29.0 | 12.5 | 13.7 | 1.48 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 27.5 | 12.0 | 13.3 | 1.59 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 37.0 | 13.0 | 14.0 | 1.68 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 27.5 | 11.7 | 13.2 | 1.72 |  |  |
| Week 9 | 21 | 0.1% β-glucan | 15.5 | 9.8 | 11.2 | 1.65 | **1.59** | **27.1** |
| Week 9 | 21 | 1.0% β-glucan | 22.5 | 11.2 | 12.5 | 1.60 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 35.5 | 13.5 | 15.0 | 1.44 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 25.0 | 11.8 | 13.0 | 1.52 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 22.0 | 11.5 | 12.7 | 1.45 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 24.0 | 11.6 | 12.8 | 1.54 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 31.5 | 13.0 | 14.4 | 1.43 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 31.0 | 12.7 | 14.0 | 1.51 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 38.0 | 14.6 | 15.5 | 1.22 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 18.5 | 10.4 | 11.5 | 1.64 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 14.0 | 9.8 | 10.7 | 1.49 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 19.5 | 10.8 | 12.0 | 1.55 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 27.5 | 12.8 | 14.3 | 1.31 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 17.5 | 10.7 | 11.7 | 1.43 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 45.5 | 14.4 | 15.8 | 1.52 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 27.0 | 12.1 | 13.3 | 1.52 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 28.0 | 12.5 | 13.6 | 1.43 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 29.5 | 12.7 | 14.1 | 1.44 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 19.5 | 10.8 | 12.0 | 1.55 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 28.0 | 12.4 | 13.5 | 1.47 |  |  |
| Week 9 | 21 | 1.0% β-glucan | 23.5 | 11.7 | 13.0 | 1.47 | **1.48** | **26.4** |
| Week 9 | 21 | 5.0% β-glucan | 19.0 | 10.8 | 12.1 | 1.51 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 32.5 | 13.0 | 14.5 | 1.48 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 30.5 | 12.8 | 14.0 | 1.45 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 18.0 | 10.5 | 11.8 | 1.55 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 21.0 | 11.2 | 12.4 | 1.49 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 31.5 | 13.0 | 14.2 | 1.43 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 30.5 | 12.8 | 14.0 | 1.45 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 32.0 | 13.0 | 14.5 | 1.46 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 20.0 | 11.2 | 12.5 | 1.42 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 26.5 | 12.3 | 14.0 | 1.42 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 27.0 | 12.2 | 13.5 | 1.49 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 34.5 | 13.0 | 14.5 | 1.57 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 34.5 | 13.4 | 14.8 | 1.43 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 18.5 | 10.9 | 12.2 | 1.43 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 33.5 | 13.5 | 14.7 | 1.36 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 31.5 | 13.0 | 14.4 | 1.43 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 44.5 | 14.8 | 16.0 | 1.37 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 25.5 | 12.4 | 13.6 | 1.34 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 22.5 | 11.4 | 12.5 | 1.52 |  |  |
| Week 9 | 21 | 5.0% β-glucan | 15.5 | 10.0 | 10.9 | 1.55 | **1.46** | **27.5** |
|  |  |  |  |  |  |  |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 30.0 | 12.3 | 13.8 | 1.61 |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 26.5 | 12.0 | 13.3 | 1.53 |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 19.5 | 10.5 | 11.6 | 1.68 |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 41.5 | 14.2 | 15.4 | 1.45 |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 25.0 | 11.8 | 13.1 | 1.52 |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 24.5 | 11.3 | 12.6 | 1.70 |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 25.0 | 11.7 | 13.0 | 1.56 |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 23.5 | 11.5 | 12.8 | 1.55 |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 26.0 | 11.6 | 13.0 | 1.67 |  |  |
| Week 10 | 28 | 0% β-glucan (uninfected control) | 32.5 | 12.6 | 14.1 | 1.62 | **1.59** | **27.4** |
| Week 10 | 28 | 0% β-glucan | 28.0 | 12.1 | 13.4 | 1.58 |  |  |
| Week 10 | 28 | 0% β-glucan | 29.5 | 12.3 | 13.7 | 1.59 |  |  |
| Week 10 | 28 | 0% β-glucan | 47.5 | 14.3 | 16.0 | 1.62 |  |  |
| Week 10 | 28 | 0% β-glucan | 23.5 | 11.6 | 12.8 | 1.51 |  |  |
| Week 10 | 28 | 0% β-glucan | 27.5 | 12.3 | 13.6 | 1.48 |  |  |
| Week 10 | 28 | 0% β-glucan | 26.5 | 12.4 | 13.3 | 1.39 |  |  |
| Week 10 | 28 | 0% β-glucan | 36.0 | 13.5 | 14.7 | 1.46 |  |  |
| Week 10 | 28 | 0% β-glucan | 29.0 | 12.3 | 13.5 | 1.56 |  |  |
| Week 10 | 28 | 0% β-glucan | 31.0 | 12.7 | 13.9 | 1.51 |  |  |
| Week 10 | 28 | 0% β-glucan | 29.5 | 12.7 | 14.0 | 1.44 |  |  |
| Week 10 | 28 | 0% β-glucan | 25.0 | 11.9 | 13.0 | 1.48 |  |  |
| Week 10 | 28 | 0% β-glucan | 27.5 | 12.6 | 13.7 | 1.37 |  |  |
| Week 10 | 28 | 0% β-glucan | 32.5 | 13.2 | 14.6 | 1.41 |  |  |
| Week 10 | 28 | 0% β-glucan | 24.0 | 11.5 | 12.7 | 1.58 |  |  |
| Week 10 | 28 | 0% β-glucan | 50.0 | 15.4 | 16.2 | 1.37 |  |  |
| Week 10 | 28 | 0% β-glucan | 20.0 | 10.8 | 12.0 | 1.59 |  |  |
| Week 10 | 28 | 0% β-glucan | 23.0 | 11.3 | 12.7 | 1.59 |  |  |
| Week 10 | 28 | 0% β-glucan | 21.5 | 11.2 | 12.3 | 1.53 |  |  |
| Week 10 | 28 | 0% β-glucan | 23.0 | 11.4 | 12.8 | 1.55 |  |  |
| Week 10 | 28 | 0% β-glucan | 17.5 | 9.8 | 10.8 | 1.86 |  |  |
| Week 10 | 28 | 0% β-glucan | 33.5 | 13.2 | 14.7 | 1.46 |  |  |
| Week 10 | 28 | 0% β-glucan | 22.5 | 11.2 | 12.1 | 1.60 |  |  |
| Week 10 | 28 | 0% β-glucan | 23.5 | 11.4 | 12.7 | 1.59 |  |  |
| Week 10 | 28 | 0% β-glucan | 27.0 | 11.8 | 13.0 | 1.64 |  |  |
| Week 10 | 28 | 0% β-glucan | 20.0 | 11.0 | 11.9 | 1.50 |  |  |
| Week 10 | 28 | 0% β-glucan | 21.5 | 10.9 | 12.1 | 1.66 |  |  |
| Week 10 | 28 | 0% β-glucan | 42.0 | 14.0 | 15.0 | 1.53 |  |  |
| Week 10 | 28 | 0% β-glucan | 21.5 | 11.2 | 12.4 | 1.53 |  |  |
| Week 10 | 28 | 0% β-glucan | 54.0 | 15.7 | 16.9 | 1.40 |  |  |
| Week 10 | 28 | 0% β-glucan | 20.5 | 10.4 | 11.6 | 1.82 | **1.54** | **28.6** |
| Week 10 | 28 | 0.1% β-glucan | 38.0 | 13.7 | 15.1 | 1.48 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 25.5 | 11.9 | 13.2 | 1.51 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 37.0 | 13.4 | 14.9 | 1.54 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 21.5 | 11.1 | 12.2 | 1.57 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 21.5 | 11.0 | 12.2 | 1.62 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 29.0 | 12.0 | 13.2 | 1.68 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 17.0 | 10.0 | 11.1 | 1.70 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 23.0 | 11.4 | 12.5 | 1.55 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 18.0 | 10.3 | 11.2 | 1.65 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 24.0 | 11.2 | 12.4 | 1.71 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 27.5 | 12.5 | 13.7 | 1.41 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 29.0 | 12.4 | 13.7 | 1.52 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 39.5 | 14.2 | 15.4 | 1.38 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 42.5 | 14.0 | 15.2 | 1.55 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 26.0 | 12.0 | 12.9 | 1.50 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 32.0 | 12.8 | 14.0 | 1.53 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 27.5 | 12.3 | 13.7 | 1.48 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 17.5 | 10.3 | 11.2 | 1.60 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 32.5 | 12.4 | 13.8 | 1.70 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 23.0 | 11.1 | 12.4 | 1.68 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 41.0 | 14.0 | 14.9 | 1.49 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 41.0 | 13.7 | 15.0 | 1.59 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 40.5 | 14.1 | 15.2 | 1.44 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 27.0 | 12.4 | 13.5 | 1.42 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 24.5 | 11.2 | 12.7 | 1.74 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 32.0 | 12.2 | 13.4 | 1.76 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 31.0 | 12.5 | 13.7 | 1.59 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 28.5 | 12.5 | 13.8 | 1.46 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 47.0 | 14.6 | 16.0 | 1.51 |  |  |
| Week 10 | 28 | 0.1% β-glucan | 19.5 | 10.8 | 12.0 | 1.55 | **1.56** | **29.5** |
| Week 10 | 28 | 1.0% β-glucan | 18.0 | 10.4 | 11.7 | 1.60 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 24.0 | 11.5 | 12.7 | 1.58 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 17.0 | 10.4 | 11.4 | 1.51 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 16.0 | 9.9 | 11.0 | 1.65 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 39.0 | 13.8 | 15.0 | 1.48 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 20.0 | 10.7 | 11.9 | 1.63 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 37.0 | 13.4 | 14.5 | 1.54 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 33.5 | 13.2 | 14.3 | 1.46 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 17.5 | 10.5 | 11.7 | 1.51 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 43.5 | 14.0 | 15.4 | 1.59 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 26.0 | 12.4 | 13.2 | 1.36 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 34.5 | 13.4 | 14.3 | 1.43 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 31.0 | 13.3 | 14.2 | 1.32 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 27.5 | 12.5 | 13.6 | 1.41 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 18.5 | 10.5 | 11.6 | 1.60 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 31.0 | 12.9 | 14.3 | 1.44 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 21.0 | 11.0 | 12.0 | 1.58 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 29.5 | 12.7 | 14.1 | 1.44 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 26.0 | 12.1 | 13.5 | 1.47 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 35.0 | 13.6 | 14.8 | 1.39 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 32.0 | 12.5 | 13.7 | 1.64 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 24.0 | 11.4 | 12.6 | 1.62 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 50.0 | 15.0 | 16.1 | 1.48 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 30.5 | 12.7 | 13.9 | 1.49 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 32.5 | 12.9 | 14.9 | 1.51 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 17.5 | 10.2 | 11.4 | 1.65 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 28.5 | 12.3 | 13.6 | 1.53 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 26.0 | 12.3 | 13.5 | 1.40 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 25.0 | 11.9 | 13.2 | 1.48 |  |  |
| Week 10 | 28 | 1.0% β-glucan | 16.0 | 10.0 | 11.1 | 1.60 | **1.51** | **27.6** |
| Week 10 | 28 | 5.0% β-glucan | 50.5 | 14.9 | 16.9 | 1.53 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 25.0 | 11.7 | 12.8 | 1.56 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 21.5 | 11.2 | 12.5 | 1.53 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 27.0 | 12.2 | 13.4 | 1.49 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 18.5 | 10.5 | 11.7 | 1.60 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 51.0 | 15.7 | 16.5 | 1.32 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 46.5 | 14.7 | 16.2 | 1.46 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 23.5 | 11.5 | 12.7 | 1.55 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 34.5 | 13.4 | 14.7 | 1.43 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 16.0 | 10.0 | 11.1 | 1.60 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 26.5 | 12.2 | 13.5 | 1.46 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 30.5 | 12.4 | 13.7 | 1.60 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 33.5 | 13.3 | 14.5 | 1.42 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 23.5 | 11.4 | 12.8 | 1.59 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 33.0 | 13.7 | 15.1 | 1.28 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 18.0 | 10.2 | 11.2 | 1.70 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 20.5 | 11.3 | 12.4 | 1.42 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 28.5 | 12.5 | 13.7 | 1.46 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 39.5 | 13.9 | 15.0 | 1.47 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 34.0 | 13.6 | 14.7 | 1.35 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 31.0 | 12.7 | 14.0 | 1.51 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 39.0 | 13.6 | 14.9 | 1.55 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 31.0 | 12.9 | 14.2 | 1.44 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 28.0 | 12.5 | 13.6 | 1.43 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 18.0 | 10.7 | 12.0 | 1.47 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 28.5 | 12.4 | 13.6 | 1.49 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 24.5 | 11.5 | 12.8 | 1.61 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 21.0 | 11.4 | 12.5 | 1.42 |  |  |
| Week 10 | 28 | 5.0% β-glucan | 28.5 | 12.5 | 13.7 | 1.46 |  |  |
| Week 10 | 28 | 5.0% β-glucan | - | - | - | - | **1.49** | **29.3** |

Additional file 1: Figure S6. Average weight of the fish per treatment over the course of the experiment.

Chart, box and whisker chart

Description automatically generated

Additional file 1: Figure S7. Average Fulton's condition factor (K) of the fish per treatment over the course of the experiment.

Chart, box and whisker chart

Description automatically generated

Additional file 1: Table S8. All metabolites measured in the serum of the fish for all investigated groups.

|  |
| --- |
| **Metabolites** |
| **FIA compounds** |  |  |  |  |
| Carnitine (free) |
| Acetylcarnitine |
| Propionylcarnitine |
| Propenoylcarnitine |
| Hydroxypropionylcarnitine |
| Butyrylcarnitine / Isobutyrylcarnitine |
| Butenoylcarnitine |
| Hydroxybutyrylcarnitine (Malonylcarnitine) |
| Isovalerylcarnitine / 2-Methylbutyrylcarnitine / Valerylcarnitine |
| Tiglylcarnitine / 3-Methyl-crotonylcarnitine |
| Glutaconylcarnitine / Mesaconylcarnitine |
| Glutarylcarnitine (Hydroxyhexanoylcarnitine [= Hydroxycaproylcarnitine]) |
| Methylglutarylcarnitine |
| Hydroxyisovalerylcarnitine / Hydroxy-2-methylbutyryl / Hydroxyvalerylcarnitine (Methylmalonylcarnitine) |
| Hexanoylcarnitine [= Caproylcarnitine] (Fumarylcarnitine) |
| Hexenoylcarnitine |
| Pimelylcarnitine |
| Octanoylcarnitine [= Caprylylcarnitine] |
| Nonanoylcarnitine [= Pelargonylcarnitine] |
| Decanoylcarnitine [= Caprylcarnitine] |
| Decenoylcarnitine |
| Decadienoylcarnitine |
| Dodecanoylcarnitine [= Laurylcarnitine] |
| Dodecenoylcarnitine |
| Dodecanedioylcarnitine |
| Tetradecanoylcarnitine [= Myristylcarnitine] |
| Tetradecenoylcarnitine [= Myristoleylcarnitine] |
| Hydroxytetradecenoylcarnitine [= Hydroxymyristoleylcarnitine] |
| Tetradecadienoylcarnitine |
| Hydroxytetradecadienoylcarnitine |
| Hexadecanoylcarnitine [= Palmitoylcarnitine] |
| Hexadecenoylcarnitine [= Palmitoleylcarnitine] |
| Hydroxyhexadecenoylcarnitine [= Hydroxypalmitoleylcarnitine] |
| Hexadecadienoylcarnitine |
| Hydroxyhexadecadienoylcarnitine |
| Hydroxyhexadecanolycarnitine [= Hydroxypalmitoylcarnitine] |
| Octadecanoylcarnitine [= Stearylcarnitine] |
| Octadecenoylcarnitine [= Oleylcarnitine] |
| Hydroxyoctadecenoylcarnitine [= Hydroxyoleylcarnitine] |
| Octadecadienoylcarnitine [= Linoleylcarnitine] |
| Lysophosphatidylcholine with acyl residue C16:1 |
| Lysophosphatidylcholine with acyl residue C17:0 |
| Lysophosphatidylcholine with acyl residue C18:0 |
| Lysophosphatidylcholine with acyl residue C18:1 |
| Lysophosphatidylcholine with acyl residue C18:2 |
| Lysophosphatidylcholine with acyl residue C20:3 |
| Lysophosphatidylcholine with acyl residue C20:4 |
| Lysophosphatidylcholine with acyl residue C24:0 |
| Lysophosphatidylcholine with acyl residue C26:0 |
| Lysophosphatidylcholine with acyl residue C26:1 |
| Lysophosphatidylcholine with acyl residue C28:0 |
| Lysophosphatidylcholine with acyl residue C28:1 |
| Lysophosphatidylcholine with acyl residue C30:0 |
| Phosphatidylcholine with diacyl residue sum C30:2 |
| Phosphatidylcholine with diacyl residue sum C32:0 |
| Phosphatidylcholine with diacyl residue sum C32:1 |
| Phosphatidylcholine with diacyl residue sum C32:2 |
| Phosphatidylcholine with diacyl residue sum C32:3 |
| Phosphatidylcholine with diacyl residue sum C34:1 |
| Phosphatidylcholine with diacyl residue sum C34:2 |
| Phosphatidylcholine with diacyl residue sum C34:3 |
| Phosphatidylcholine with diacyl residue sum C34:4 |
| Phosphatidylcholine with diacyl residue sum C36:0 |
| Phosphatidylcholine with diacyl residue sum C36:1 |
| Phosphatidylcholine with diacyl residue sum C36:2 |
| Phosphatidylcholine with diacyl residue sum C36:3 |
| Phosphatidylcholine with diacyl residue sum C36:4 |
| Phosphatidylcholine with diacyl residue sum C36:5 |
| Phosphatidylcholine with diacyl residue sum C36:6 |
| Phosphatidylcholine with diacyl residue sum C38:0 |
| Phosphatidylcholine with diacyl residue sum C38:1 |
| Phosphatidylcholine with diacyl residue sum C38:3 |
| Phosphatidylcholine with diacyl residue sum C38:4 |
| Phosphatidylcholine with diacyl residue sum C38:5 |
| Phosphatidylcholine with diacyl residue sum C38:6 |
| Phosphatidylcholine with diacyl residue sum C40:1 |
| Phosphatidylcholine with diacyl residue sum C40:2 |
| Phosphatidylcholine with diacyl residue sum C40:3 |
| Phosphatidylcholine with diacyl residue sum C40:4 |
| Phosphatidylcholine with diacyl residue sum C40:5 |
| Phosphatidylcholine with diacyl residue sum C40:6 |
| Phosphatidylcholine with diacyl residue sum C42:0 |
| Phosphatidylcholine with diacyl residue sum C42:1 |
| Phosphatidylcholine with diacyl residue sum C42:2 |
| Phosphatidylcholine with diacyl residue sum C42:4 |
| Phosphatidylcholine with diacyl residue sum C42:5 |
| Phosphatidylcholine with diacyl residue sum C42:6 |
| Phosphatidylcholine with acyl-alkyl residue sum C30:0 |
| Phosphatidylcholine with acyl-alkyl residue sum C30:1 |
| Phosphatidylcholine with acyl-alkyl residue sum C30:2 |
| Phosphatidylcholine with acyl-alkyl residue sum C32:1 |
| Phosphatidylcholine with acyl-alkyl residue sum C32:2 |
| Phosphatidylcholine with acyl-alkyl residue sum C34:0 |
| Phosphatidylcholine with acyl-alkyl residue sum C34:1 |
| Phosphatidylcholine with acyl-alkyl residue sum C34:2 |
| Phosphatidylcholine with acyl-alkyl residue sum C34:3 |
| Phosphatidylcholine with acyl-alkyl residue sum C36:0 |
| Phosphatidylcholine with acyl-alkyl residue sum C36:1 |
| Phosphatidylcholine with acyl-alkyl residue sum C36:2 |
| Phosphatidylcholine with acyl-alkyl residue sum C36:3 |
| Phosphatidylcholine with acyl-alkyl residue sum C36:4 |
| Phosphatidylcholine with acyl-alkyl residue sum C36:5 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:0 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:1 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:2 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:3 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:4 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:5 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:6 |
| Phosphatidylcholine with acyl-alkyl residue sum C40:0 |
| Phosphatidylcholine with acyl-alkyl residue sum C40:1 |
| Phosphatidylcholine with acyl-alkyl residue sum C40:2 |
| Phosphatidylcholine with acyl-alkyl residue sum C40:3 |
| Phosphatidylcholine with acyl-alkyl residue sum C40:4 |
| Phosphatidylcholine with acyl-alkyl residue sum C40:5 |
| Phosphatidylcholine with acyl-alkyl residue sum C40:6 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:0 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:1 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:2 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:3 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:4 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:5 |
| Phosphatidylcholine with acyl-alkyl residue sum C44:3 |
| Phosphatidylcholine with acyl-alkyl residue sum C44:4 |
| Phosphatidylcholine with acyl-alkyl residue sum C44:5 |
| Phosphatidylcholine with acyl-alkyl residue sum C44:6 |
| Hydroxysphingomyelin with acyl residue sum C14:1 |
| Hydroxysphingomyelin with acyl residue sum C16:1 |
| Hydroxysphingomyelin with acyl residue sum C22:1 |
| Hydroxysphingomyelin with acyl residue sum C22:2 |
| Hydroxysphingomyelin with acyl residue sum C24:1 |
| Sphingomyelin with acyl residue sum C16:0 |
| Sphingomyelin with acyl residue sum C16:1 |
| Sphingomyelin with acyl residue sum C18:0 |
| Sphingomyelin with acyl residue sum C18:1 |
| Sphingomyelin with acyl residue sum C20:2 |
| Sphingomyelin with acyl residue sum C22:3 |
| Sphingomyelin with acyl residue sum C24:0 |
| Sphingomyelin with acyl residue sum C24:1 |
| Sphingomyelin with acyl residue sum C26:0 |
| Sphingomyelin with acyl residue sum C26:1 |
| Sugars |
| (C2+C3) / C0 |
| C2 / C0 |
| CPT-I ratio |
| MUFA (PC) |
| MUFA (PC) / SFA (PC) |
| PUFA (PC) |
| PUFA (PC) / MUFA (PC) |
| PUFA (PC) / SFA (PC) |
| SFA (PC) |
| Total (PC+SM) |
| Total AC / C0 |
| Total AC-DC / Total AC |
| Total AC-OH / Total AC |
| Total lysoPC |
| Total lysoPC / Total PC |
| Total PC |
| Total PC aa |
| Total PC ae |
| Total SM |
| Total SM / Total (SM+PC) |
| Total SM / Total PC |
| Total SM-non OH |
| Total SM-OH |
| Total SM-OH / Total SM-non OH |
| **LC compounds** |
| Alanine |
| Arginine |
| Asparagine |
| Aspartic acid |
| Cysteine |
| Glutamine |
| Glutamic acid |
| Glycine |
| Histidine |
| Isoleucine |
| Leucine |
| Lysine |
| Methionine |
| Ornithine |
| Phenylalanine |
| Proline |
| Serine |
| Threonine |
| Tryptophan |
| Tyrosine |
| Valine |
| Ac-Orn |
| ADMA |
| Alpha-AAA |
| c4-OH-Pro |
| Creatinine |
| DOPA |
| Histamine |
| Met-SO |
| Nitrotyrosine |
| Putrescine |
| SDMA |
| Serotonin |
| Spermidine |
| t4-OH-Pro |
| Taurine |
| Total DMA |
| AAA |
| ADMA-Arginine |
| BCAA |
| Cit-Arg |
| Cit-Orn |
| Essential Amino acids |
| Fisher ratio |
| Glucogenic AA |
| Met-SO-Met |
| Non-essential Amino acids |
| Orn-Arg |
| Putrescine-Orn |
| SDMA-rp |
| Serotonin-rp |
| Spermidine-Putrescine |
| Spermine-Spermidine |
| Total Amino acids |
| Total DMA-Arg |
| Tyr-Phe |

Additional file 1: Table S9. Metabolites measured at significantly levels between treated fish and the control. Arrows indicate if the metabolite were upregulated (↑) or downregulated (↓) relative to the control without β-glucan treatment. Lack of significant change is indicated by “No”.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Metabolite | 0.1% | 1.0% | 5.0% | p-value |
| **FIA compounds** |  |  |  |  |
| Lysophosphatidylcholine with acyl residue C16:1 | No | No | ↑ | < 0.05 |
| Phosphatidylcholine with acyl-alkyl residue sum C26:0 | No | No | ↑ | < 0.03 |
| Phosphatidylcholine with acyl-alkyl residue sum C30:0 | ↓ | No | No | < 0.05 |
| Phosphatidylcholine with acyl-alkyl residue sum C32:0 | ↓ | No | No | < 0.04 |
| Phosphatidylcholine with acyl-alkyl residue sum C32:1 | No | ↓ | No | < 0.05 |
| Phosphatidylcholine with acyl-alkyl residue sum C36:0 | No | No | ↓ | < 0.04 |
| Phosphatidylcholine with acyl-alkyl residue sum C36:5 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:0 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:1 | No | No | ↓ | < 0.01 |
| Phosphatidylcholine with acyl-alkyl residue sum C38:5 | No | No | ↓ | < 0.03 |
| Phosphatidylcholine with acyl-alkyl residue sum C40:1 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with acyl-alkyl residue sum C40:5 | No | No | ↓ | < 0.01 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:0 | No | No | ↓ | < 0.01 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:1 | No | No | ↓ | < 0.05 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:5 | No | No | ↓ | < 0.03 |
| Phosphatidylcholine with acyl-alkyl residue sum C42:6 | No | No | ↓ | < 0.03 |
| Phosphatidylcholine with diacyl residue sum C32:1 | ↓ | ↓ | No | < 0.04 |
| Phosphatidylcholine with diacyl residue sum C32:2 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with diacyl residue sum C36:0 | No | No | ↓ | < 0.01 |
| Phosphatidylcholine with diacyl residue sum C36:4 | ↓ | ↓ | ↓ | < 0.04 |
| Phosphatidylcholine with diacyl residue sum C36:5 | ↓ | ↓ | ↓ | < 0.04 |
| Phosphatidylcholine with diacyl residue sum C38:0 | No | No | ↓ | < 0.05 |
| Phosphatidylcholine with diacyl residue sum C38:1 | No | No | ↓ | < 0.05 |
| Phosphatidylcholine with diacyl residue sum C38:1 | No | No | ↓ | < 0.03 |
| Phosphatidylcholine with diacyl residue sum C38:2 | No | No | ↓ | < 0.03 |
| Phosphatidylcholine with diacyl residue sum C38:3 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with diacyl residue sum C38:4 | No | ↓ | ↓ | < 0.04 |
| Phosphatidylcholine with diacyl residue sum C38:5 | No | ↓ | ↓ | < 0.03 |
| Phosphatidylcholine with diacyl residue sum C38:6 | No | No | ↓ | < 0.04 |
| Phosphatidylcholine with diacyl residue sum C40:1 | No | No | ↓ | < 0.04 |
| Phosphatidylcholine with diacyl residue sum C40:2 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with diacyl residue sum C40:4 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with diacyl residue sum C40:6 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with diacyl residue sum C42:3 | No | No | ↓ | < 0.03 |
| Phosphatidylcholine with diacyl residue sum C42:4 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with diacyl residue sum C42:5 | No | No | ↓ | < 0.05 |
| Phosphatidylcholine with diacyl residue sum C44:3 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with diacyl residue sum C44:5 | No | No | ↓ | < 0.02 |
| Phosphatidylcholine with diacyl residue sum C44:6 | No | No | ↓ | < 0.01 |
| PUFA (PC) | No | No | ↓ | < 0.01 |
| SFA (PC) | No | No | ↓ | < 0.03 |
| Total (PC+SM) | No | No | ↓ | < 0.02 |
| Total lysoPC / Total PC | ↑ | ↑ | ↑ | < 0.02 |
| Total Phosphatidylcholine | No | No | ↓ | < 0.01 |
| Hydroxysphingomyelin with acyl residue sum C14:1 | ↓ | No | No | < 0.02 |
| Hydroxysphingomyelin with acyl residue sum C22:2 | No | No | ↓ | < 0.02 |
| Hydroxysphingomyelin with acyl residue sum C18:1 | ↓ | ↓ | ↓ | < 0.02 |
| Hydroxysphingomyelin with acyl residue sum C20:2 | No | ↓ | No | < 0.02 |
| Hydroxysphingomyelin with acyl residue sum C22:3 | No | No | ↓ | < 0.02 |
| Acylcarnitines-C12:1 | No | ↓ | ↓ | < 0.03 |
| Acylcarnitines-C14:1 | No | ↓ | ↓ | < 0.01 |
| Acylcarnitines-C14:2 | No | No | ↓ | < 0.03 |
| **LC compounds** |  |  |  |  |
| Alanine | No | No | ↑ | <0.05 |

Additional file 1: Figure S10. Survival curves of the fish following 9 hours bath exposure to 1.6 × 107 CFU·mL-1 of live *Y. ruckeri* O1 biotype 2 (100415-1/4).

A picture containing chart

Description automatically generated