**Pathway-oriented action of dietary essential oils to prevent muscle** **protein oxidation and texture deterioration of farmed rainbow trout**

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**Short title:** Essential oil diet prevents protein oxidation

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Supplementary Material. **Table S1** *Texture parameter values during 165 days of frozen storage (–10 ºC) on the muscle of rainbow trout (Oncorhynchus mykiss) fed control (C) or essential oil (M) diets1.*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Diet | Storage (days) | | | | | | | *P*  (storage) |
|  | 0 | 30 | 45 | 75 | 105 | 135 | 165 |
| Hardness (N) | C | 4.71 ± 0.83bd | 6.20 ± 0.48a | 5.32 ± 0.41ab | 2.94 ± 1.11c | 4.20 ± 0.32cd | 6.13 ± 0.60ab | 4.35 ± 0.40Bcd | \*\*\* |
|  | M | 4.23 ± 1.34ab | 5.84 ± 0.68a | 5.34 ± 0.42ab | 3.41 ± 1.66b | 3.76 ± 0.17b | 6.21 ± 1.32a | 5.05 ± 0.04Aab | \*\*\* |
| *P* (diet) |  | ns | ns | ns | ns | ns | ns | \* |  |
|  |  |  |  |  |  |  |  |  |  |
| Cohesiveness (ratio) | C | 0.27 ± 0.02c | 0.42 ± 0.03a | 0.35 ± 0.05b | 0.42 ± 0.03a | 0.40 ± 0.00Bab | 0.46 ± 0.01a | 0.42 ± 0.03a | \*\*\* |
|  | M | 0.32 ± 0.04c | 0.40 ± 0.04ab | 0.35 ± 0.01bc | 0.41 ± 0.02ab | 0.46 ± 0.03Aa | 0.47 ± 0.02a | 0.40 ± 0.04ab | \*\*\* |
| *P* (diet) |  | ns | ns | ns | ns | \*\* | ns | ns |  |
|  |  |  |  |  |  |  |  |  |  |
| Resilience (ratio) | C | 0.05 ± 0.00c | 0.12 ± 0.02a | 0.08 ± 0.03bc | 0.07 ± 0.02bc | 0.10 ± 0.01ab | 0.12 ± 0.01a | 0.11 ± 0.01Bab | \*\*\* |
|  | M | 0.06 ± 0.02b | 0.12 ± 0.01a | 0.08 ± 0.01bc | 0.08 ± 0.02bcd | 0.10 ± 0.03acd | 0.13 ± 0.01a | 0.12 ± 0.00Aad | \*\*\* |
| *P* (diet) |  | ns | ns | ns | ns | ns | ns | \* |  |
|  |  |  |  |  |  |  |  |  |  |
| Gumminess (N) | C | 1.29 ± 0.20bc | 2.57 ± 0.20a | 1.84 ± 0.32b | 1.24 ± 0.41c | 1.66 ± 0.11bc | 2.81 ± 0.31a | 1.80 ± 0.02bc | \*\*\* |
|  | M | 1.32 ± 0.31c | 2.35 ± 0.22ab | 1.86 ± 0.11bc | 1.59 ± 0.29bc | 1.73 ± 0.04bc | 2.94 ± 0.75a | 1.99 ± 0.24bc | \*\*\* |
| *P* (diet) |  | ns | ns | ns | ns | ns | ns | ns |  |
|  |  |  |  |  |  |  |  |  |  |
| Adhesiveness (N s-1) | C | 0.40 ± 0.07a | 0.14 ± 0.05c | 0.26 ± 0.07b | 0.12 ± 0.03Bc | 0.07 ± 0.02Bc | 0.25 ± 0.03Ab | 0.10 ± 0.00Ac | \*\*\* |
|  | M | 0.42 ± 0.15a | 0.14 ± 0.01b | 0.40 ± 0.12a | 0.23 ± 0.07Aab | 0.19 ± 0.08Ab | 0.14 ± 0.04Bb | 0.07 ± 0.01Bb | \*\*\* |
| *P* (diet) |  | ns | ns | ns | \* | \* | \*\* | \*\* |  |

1Values are mean ± standard deviation (n=3). Means with different capital letters in the same column (different diet) are significantly different at *P* < 0.05 between diets.Means with different lowercase letters in the same row (different storage day) are significantly different at *P* < 0.05 among days of frozen storage. Means with same letters are not significantly different (*P* > 0.05).

Significance of diet showed under each column, significance of storage day showed on the right side of each row.

Significance: \* *P* < 0.05; \*\* *P* < 0.01; \*\*\* *P* < 0.001. ns: not significant (*P* > 0.05).

Supplementary Material. **Table S2** *Total lipids (g/kg) and fatty acid profile (in g/kg of total fatty acids) of muscle of rainbow trout (Oncorhynchus mykiss) fed control (C) or essential oil (M) diets1.*

|  |  |  |  |
| --- | --- | --- | --- |
|  | C | M | *P* value |
| Total lipids | 48.8 ± 4.2 | 54.3 ± 7.3 | ns |
| C14:0 | 27.2 ± 2.0 | 22.0 ± 0.9 | \* |
| C15:0 | 2.4 ± 0.1 | 2.5 ± 0.1 | ns |
| C16:0 | 138.2 ± 9.2 | 144.5 ± 6.8 | ns |
| C16:1n-7 | 27.2 ± 2.0 | 28.2 ± 0.4 | ns |
| C17:0 | 4.6 ± 0.4 | 4.6 ± 0.4 | ns |
| C18:0 | 38.4 ± 3.1 | 39.0 ± 1.7 | ns |
| C18:1n-9 | 182.1 ± 10.9 | 180.1 ± 6.0 | ns |
| C18:1n-7 | 25.3 ± 0.4 | 24.4 ± 1.4 | ns |
| C18:2n-6 (LA) | 272.4 ± 23.5 | 266.2 ± 10.7 | ns |
| C20:0 | 2.2 ± 0.4 | 2.1 ± 0.0 | ns |
| C18:3n-3 (LNA) | 27.3 ± 0.2 | 25.9 ± 0.6 | \* |
| C20:1n-9 | 9.5 ± 1.5 | 9.9 ± 2.5 | ns |
| C18:4n-3 | 4.1 ± 1.0 | 1.7 ± 0.4 | \* |
| C20:2n-6 | 13.2 ± 0.9 | 11.4 ± 0.5 | \* |
| C20:3n-6 | 8.0 ± 1.1 | 7.2 ± 0.7 | ns |
| C20:4n-6 | 11.2 ± 1.5 | 10.4 ± 0.9 | ns |
| C22:1n-11 | 3.5 ± 2.2 | 3.3 ± 1.0 | ns |
| C22:1n-9 | 1.6 ± 0.2 | 2.0 ± 0.8 | ns |
| C20:4n-3 | 5.6 ± 0.7 | 5.9 ± 0.9 | ns |
| C20:5n-3 (EPA) | 30.8 ± 2.3 | 33.1 ± 4.4 | ns |
| C22:4n-6 | 1.9 ± 0.8 | 1.4 ± 0.2 | ns |
| C24:1n-9 | 4.5 ± 0.6 | 4.3 ± 0.4 | ns |
| C22:5n-3 | 14.5 ± 0.6 | 14.9 ± 1.0 | ns |
| C22:6n-3 (DHA) | 150.7 ± 22.2 | 155.1 ± 5.1 | ns |
| SFA | 213.0 ± 12.6 | 214.7 ± 8.6 | ns |
| MUFA | 253.7 ± 15.5 | 252.1 ± 5.0 | ns |
| PUFA | 539.6 ± 14.4 | 533.2 ± 3.7 | ns |
| n-3 | 232.8 ± 25.9 | 236.7 ± 9.5 | ns |
| n-6 | 306.8 ± 21.8 | 296.5 ± 11.4 | ns |
| DHA/EPA | 48.7 ± 3.6 | 47.2 ± 4.8 | ns |
| n-6/n-3 | 13.3 ± 2.3 | 12.6 ± 1.0 | ns |
| DHA/LA | 5.6 ± 1.2 | 5.8 ± 0.4 | ns |

1Values are mean ± standard deviation (n=3).

Significance: \* represents significant differences (*P* < 0.05) between diets. ns, not significant (*P* > 0.05);

LA: linoleic acid; LNA: alpha-linolenic acid; EPA: eicosapentaenoic acid; DHA: docosahexaenoic acid;

SFA: total saturated fatty acids; MUFA: total monounsaturated fatty acids; PUFA: total polyunsaturated fatty acids; n-3: total omega-3 fatty acids; n-6: total omega-6 fatty acids.

Supplementary Material. **Figure S1** (A) (B) Representative mono-dimensional electrophoresis (1-DE) fluorescein-5-thiosemicarbazide (FTSC)-stained gel of sarcoplasmic proteins from rainbow trout (*Oncorhynchus mykiss*) fed control/essential oil diet. (C) (D) Representative 1-DE FTSC-stained gel of myofibrillar proteins from from rainbow trout (*Oncorhynchus mykiss*) fed control/essential oil diet.

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Supplementary Material. **Figure S2** (A) (B) Representative mono-dimensional electrophoresis (1-DE) Coomassie-stained gel of sarcoplasmic proteins from rainbow trout (*Oncorhynchus mykiss*) fed control/essential oil diet. (C) (D) Representative 1-DE Coomassie-stained gel of myofibrillar proteins from rainbow trout (*Oncohrynchus mykiss*) fed control/essential oil diet.

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