

Table S1. Concentrate ingredients of the four dietary treatments (CON, CS6, CS11, CS16) with different levels of *Camelina sativa* seeds (0, 60, 110, and 160 g·kg⁻¹ of concentrate).

| Ingredients (g/kg) | Concentrates | | | |
|------------------------------|--------------|-----|------|------|
| | CON | CS6 | CS11 | CS16 |
| <i>Camelina sativa</i> seeds | 0 | 60 | 110 | 160 |
| Maize grain | 344 | 299 | 269 | 239 |
| Barley | 200 | 200 | 200 | 200 |
| Wheat middlings | 100 | 100 | 100 | 100 |
| Sunflower meal | 160 | 180 | 180 | 180 |
| Soybean meal | 155 | 120 | 100 | 80 |
| Premix mineral and vitamins | 41 | 41 | 41 | 41 |

CON: dietary treatment with 0 g *Camelina sativa* seeds·kg⁻¹ of concentrate; CS6: dietary treatment with 60 g *Camelina sativa* seeds·kg⁻¹ of concentrate; CS11: dietary treatment with 110 g *Camelina sativa* seeds·kg⁻¹ of concentrate; CS16: dietary treatment with 160 g *Camelina sativa* seeds·kg⁻¹ of concentrate.

Table S2. Sequences of primers used for RT-PCRs, genomic regions of PCR amplification, primer efficiency, amplicon size, and hybridization temperature.

| Target Species | Genomic Region of PCR Amplification | Primer Sequencing | Primer Efficiency % | Slope | Amplicon bp | T _m °C |
|-------------------------------------|-------------------------------------|--|---------------------|--------|-------------|-------------------|
| Total bacteria | 16s rRNA | F: 5'-CGGCAACGAGCGCAACCC-3' R: 5'-CCATTGTAGCACGTGTGTAGCC-3' | 98 | -3.378 | 130 | 60 |
| Bacteroidetes | 16s rRNA | F: 5'-GGARCATGTGGTTTAATTTCGATGAT-3' R: 5'-AGCTGACGACAACCATGCAG-3' | 98 | -3.36 | 126 | 62 |
| Firmicutes | 16s rRNA | F: 5'-GGAGYATGTGGTTTAATTTCGAAGCA-3' R: 5'-AGCTGACGACAACCATGCAC-3' | 97 | -3.39 | 126 | 62 |
| Archaea | 16s rRNA | F: 5'-GAGGAAGGAGTGGACGACGGTA-3' R: 5'-ACGGGCGGTGTGTGCAAG-3' | 96 | -3.43 | 233 | 60 |
| Protozoa | 18s rRNA | F: 5'-GCTTTTCGWTGGTAGTGTATT-3' R: 5'-CTTGCCCTCYAATCGTWCT-3' | 97 | -3.39 | 223 | 55 |
| <i>Entodinium</i> | 18s rRNA | F: 5'-GAGCTAATACATGCTAAGGC-3' R: 5'-CCCTCACTACAATCGAGATTTAAGG-3' | 97 | -3.39 | 317 | 59 |
| Total fungi | 18s rRNA ITS1 | F: 5'-GAGGAAGTAAAGTCGTAACAAGGTTTC-3' R: 5'-CAAATTCACAAAGGGTAGGATGATT-3' | 98 | -3.38 | 120 | 58 |
| Neocallimastigales | 18s rRNA ITS1 | F: 5'-TTGACAATGGATCTCTTGTTCTC-3' R: 5'-GTGCAATATGCGTTCGAAGATT-3' | 96 | -3.43 | 110 | 63 |
| Methanogen | mcrA | F: 5'-TTCGGTGGATCDCARAGRGC-3' R: 5'-GBARGTCGWAWCCGTAGAATCC-3' | 95 | -3.44 | 140 | 58 |
| Methanomassiliicoccales | 16s rRNA | F: 5'-TTCTGGGGTAGGGGTAAATC-3' R: 5'-GTCTGCAGCGTTTACACCCT-3' | 97 | -3.40 | 149 | 62 |
| <i>Methanobrevibacter</i> spp. | 16s rRNA | F: 5'-TGGGAATTGCTGGWGATACTRTT-3' R: 5'-GGAGCRGCTCAAAGCCA-3' | 95 | -3.46 | 231 | 60 |
| <i>Methanospaera stadtmannae</i> | 16s rRNA | F: 5'-CTTAACATAAGAATTGCTGGAG-3' R: 5'-TTCGTTACTACCGTCAAGATC-3' | 97 | -3.39 | 150 | 58 |
| <i>Butyrivibrio fibrisolvens</i> | 16s rRNA | F: 5'-TAACATGAGAGTTTGATCCTGGCTC-3' R: 5'-CGTTACTACCCGTCCGC-3' | 97 | -3.39 | 136 | 58 |
| <i>Butyrivibrio proteoclasticus</i> | 16s rRNA | F: 5'-TCCGGTGGTATGAGATGGGC-3' R: 5'-GTCGCTGCATCAGAGTTTCT-3' | 98 | -3.38 | 185 | 60 |
| <i>Eubacterium ruminantium</i> | 16s rRNA | F: 5'-CTCCGAGACTGAGGAAGCTTG-3' R: 5'-GTCCATCTCACACCACCGGA-3' | 98 | -3.36 | 184 | 62 |

| | | | | | | |
|----------------------------------|----------|---|----|-------|-----|----|
| <i>Ruminococcus flavefaciens</i> | 16s rRNA | F: 5'-CGAACGGAGATAAATTTGAGTTTACTTAGG-3' | 95 | −3.42 | 132 | 60 |
| | | R: 5'-CGGTCTCTGTATGTTATGAGGTATTACC-3' | | | | |
| <i>Fibrobacter succinogenes</i> | 16s rRNA | F: 5'-GCGGGATTGAATGTACCTTGAGA-3' | 98 | −3.39 | 204 | 60 |
| | | R: 5'-TCCGCCTGCCCTGAACATC-3' | | | | |
| <i>Ruminococcus albus</i> | 16s rRNA | F: 5'-CCCTAAAAGCAGTCTTAGTTTCG-3' | 98 | −3.38 | 175 | 62 |
| | | R: 5'-CCTCCTTGCGGTAGAAC-3' | | | | |
| <i>Ruminobacter amylophilus</i> | 16s rRNA | F: 5'-ATGCAAGTCGAACGGTAACAGCAGG-3' | 96 | −3.42 | 115 | 65 |
| | | R: 5'-GCACCCGTTTCCAGGTGTTGTCC-3' | | | | |
| <i>Streptococcus bovis</i> | 16s rRNA | F: 5'-TTCCTAGAGATAGGAAGTTTCTTCGG-3' | 96 | −3.43 | 127 | 57 |
| | | R: 5'-ATGATGGCACTAACAATAGGGGT-3' | | | | |
| <i>Selenomonas ruminantium</i> | 16s rRNA | F: 5'-CAATAAGCATTCCGCCTGGG-3' | 99 | −3.35 | 138 | 57 |
| | | R: 5'-TTCACCTCAATGTCAAGCCCTGG-3' | | | | |
| <i>Prevotella sp.</i> | 16s rRNA | F: 5'-GGTTCTGAGAGGAAGGTCCCC-3' | 96 | −3.42 | 121 | 60 |
| | | R: 5'-TCCTGCACGCTACTTGGCTG-3' | | | | |
| <i>Prevotella brevis</i> | 16s rRNA | F: 5'-GGTTTCCTTGAGTGTATTCGACGTC-3' | 98 | −3.38 | 219 | 64 |
| | | R: 5'-CTTTCGCTTGGCCGCTG-3' | | | | |
| <i>Prevotella ruminicola</i> | 16s rRNA | F: 5'-GAAAGTCGGATTAATGCTCTATGTTG-3' | 97 | −3.39 | 74 | 63 |
| | | R: 5'-CATCCTATAGCGGTAAACCTTTGG-3' | | | | |

Table S3. Relative abundance of the microorganisms in ewes' rumen fluid of the four dietary treatments (CON, CS6, CS11, CS16) with different levels of *Camelina sativa* seeds (0, 60, 110, and 160 g·kg^{−1} of concentrate).

| | Dietary treatments | | | | SEM ^a | <i>p</i> |
|-------------------------------------|---------------------|---------------------|---------------------|--------------------|------------------|----------|
| | CON | CS6 | CS11 | CS16 | | |
| Bacteroidetes | 0.421 | 0.388 | 0.396 | 0.449 | 0.012 | 0.307 |
| Firmicutes | 0.351 | 0.413 | 0.412 | 0.370 | 0.022 | 0.737 |
| Firmicutes:Bacteroidetes | 0.844 | 1.055 | 1.047 | 0.806 | 0.048 | 0.137 |
| <i>Prevotella sp.</i> | 0.257 | 0.263 | 0.260 | 0.269 | 0.007 | 0.952 |
| <i>Prevotella ruminicola</i> | 0.160 | 0.136 | 0.166 | 0.122 | 0.007 | 0.116 |
| <i>Prevotella brevis</i> | 0.007 | 0.007 | 0.006 | 0.005 | 0.002 | 0.867 |
| Protozoa | 0.031 ^b | 0.080 ^a | 0.027 ^b | 0.044 ^b | 0.005 | <0.001 |
| Total Fungi | 0.0006 | 0.0010 | 0.0006 | 0.0005 | 0.00008 | 0.159 |
| <i>Neocallimastigales</i> | 0.0005 ^t | 0.0009 ^t | 0.0005 ^t | 0.0006 | 0.00007 | 0.051 |
| <i>Entodinium</i> | 0.010 ^b | 0.025 ^a | 0.006 ^b | 0.013 ^b | 0.002 | <0.001 |
| Archaea | 0.009 | 0.015 ^t | 0.008 ^t | 0.012 | 0.001 | 0.070 |
| Total Methanogen | 0.0010 | 0.0010 | 0.0006 | 0.0008 | 0.0001 | 0.262 |
| <i>Methanomassiliicoccales</i> | 0.009 | 0.009 | 0.007 | 0.008 | 0.0007 | 0.478 |
| <i>Methanobrevibacter</i> | <0.0001 | 0.0001 | 0.0001 | <0.0001 | 0.00001 | 0.402 |
| <i>Methanosphaera stadtmanae</i> | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.00000 | 0.469 |
| <i>Ruminococcus flavefaciens</i> | 0.0004 | 0.0004 | 0.0002 | 0.0003 | 0.00005 | 0.553 |
| <i>Ruminobacter amylophilus</i> | 0.006 ^b | 0.002 ^b | 0.014 ^a | 0.004 ^b | 0.0014 | 0.002 |
| <i>Ruminococcus albus</i> | 0.010 | 0.011 | 0.011 | 0.008 | 0.0009 | 0.518 |
| <i>Butyrivibrio fibrisolvens</i> | 0.090 | 0.094 | 0.102 | 0.092 | 0.005 | 0.794 |
| <i>Butyrivibrio proteoclasticus</i> | 0.021 | 0.019 | 0.028 | 0.020 | 0.002 | 0.342 |
| <i>Fibrobacter succinogenes</i> | 0.007 ^b | 0.027 ^a | 0.004 ^b | 0.009 ^b | 0.002 | <0.001 |
| <i>Selenomonas ruminantium</i> | 0.020 | 0.016 | 0.017 | 0.015 | 0.001 | 0.703 |
| <i>Streptococcus bovis</i> | 0.0006 | 0.0003 ^t | 0.0007 ^t | 0.0005 | 0.00006 | 0.084 |
| <i>Eubacterium ruminantium</i> | 0.001 | 0.002 | 0.002 | 0.002 | 0.0003 | 0.548 |

CON: dietary treatment with 0 g *Camelina sativa* seeds·kg^{−1} of concentrate; CS6: dietary treatment with 60 g *Camelina sativa* seeds·kg^{−1} of concentrate; CS11: dietary treatment with 110 g *Camelina sativa* seeds·kg^{−1} of concentrate; CS16: dietary treatment with 160 g *Camelina sativa* seeds·kg^{−1} of

concentrate; Different superscript letters (a. b) between dietary treatments differ significantly ($p < 0.05$) and t is referred to values between 0.05 and 0.100 ($0.05 < t < 0.10$); ^aSEM = standard error mean; $p = p$ value.

Table S4. Relative abundance of the microorganisms in ewes' rumen solid of the four dietary treatments (CON, CS6, CS11, CS16) with different levels of *Camelina sativa* seeds (0, 60, 110, and 160 g·kg⁻¹ of concentrate).

| | Dietary treatments | | | | SEM ^a | <i>p</i> |
|-------------------------------------|---------------------|----------------------|----------------------|---------------------|------------------|----------|
| | CON | CS6 | CS11 | CS16 | | |
| Bacteroidetes | 0.391 | 0.390 | 0.431 | 0.439 | 0.014 | 0.504 |
| Firmicutes | 0.373 | 0.422 | 0.379 | 0.375 | 0.016 | 0.727 |
| Firmicutes:Bacteroidetes | 0.962 | 1.112 | 0.892 | 0.866 | 0.040 | 0.143 |
| <i>Prevotella</i> spp. | 0.231 | 0.236 | 0.289 | 0.303 | 0.013 | 0.120 |
| <i>Prevotella ruminicola</i> | 0.036 | 0.027 | 0.038 | 0.038 | 0.002 | 0.157 |
| <i>Prevotella brevis</i> | 0.022 | 0.025 | 0.023 | 0.020 | 0.0002 | 0.848 |
| Protozoa | 0.024 ^b | 0.045 ^a | 0.021 ^b | 0.027 ^b | 0.003 | 0.010 |
| Total Fungi | 0.0030 ^a | 0.0023 ^{ab} | 0.0019 ^{ab} | 0.0014 ^b | 0.0002 | 0.043 |
| <i>Neocallimastigales</i> | 0.017 ^t | 0.013 | 0.011 | 0.010 ^t | 0.0001 | 0.067 |
| <i>Entodinium</i> | 0.069 | 0.147 | 0.060 | 0.096 | 0.001 | 0.136 |
| Archaea | 0.013 ^a | 0.016 ^a | 0.010 ^b | 0.010 ^b | 0.0007 | <0.001 |
| Total Methanogen | 0.0012 ^a | 0.0012 ^a | 0.0006 ^b | 0.0007 ^b | 0.0001 | 0.025 |
| <i>Methanomassiliicoccales</i> | 0.0013 | 0.0014 | 0.0009 | 0.0011 | 0.0001 | 0.307 |
| <i>Methanobrevibacter</i> | 0.00016 | 0.00019 | 0.00013 | 0.00011 | 0.00002 | 0.385 |
| <i>Methanosphaera stadtmanae</i> | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.00002 | 0.842 |
| <i>Ruminococcus flavefaciens</i> | 0.0009 ^a | 0.0006 ^{ab} | 0.0003 ^b | 0.0003 ^b | 0.00007 | 0.022 |
| <i>Ruminobacter amylophilus</i> | 0.011 ^b | 0.002 ^b | 0.025 ^a | 0.011 ^b | 0.002 | <0.001 |
| <i>Ruminococcus albus</i> | 0.071 | 0.081 ^t | 0.066 | 0.048 ^t | 0.0005 | 0.079 |
| <i>Butyrivibrio fibrisolvens</i> | 0.089 ^a | 0.094 ^a | 0.089 ^a | 0.068 ^b | 0.003 | 0.006 |
| <i>Butyrivibrio Proteoclasticus</i> | 0.038 ^b | 0.031 ^b | 0.056 ^a | 0.031 ^b | 0.003 | 0.001 |
| <i>Fibrobacter succinogenes</i> | 0.024 ^t | 0.022 ^t | 0.012 ^t | 0.012 ^t | 0.002 | 0.080 |
| <i>Selenomonas ruminantium</i> | 0.009 ^b | 0.005 ^b | 0.013 ^a | 0.015 ^a | 0.001 | 0.001 |
| <i>Streptococcus bovis</i> | 0.0007 | 0.0004 | 0.0007 | 0.0006 | 0.00006 | 0.131 |
| <i>Eubacterium ruminantium</i> | 0.006 | 0.006 | 0.006 | 0.004 | 0.0004 | 0.247 |

CON: dietary treatment with 0 g *Camelina sativa* seeds·kg⁻¹ of concentrate; CS6: dietary treatment with 60 g *Camelina sativa* seeds·kg⁻¹ of concentrate; CS11: dietary treatment with 110 g *Camelina sativa* seeds·kg⁻¹ of concentrate; CS16: dietary treatment with 160 g *Camelina sativa* seeds·kg⁻¹ of concentrate; Different superscript letters (a. b) between dietary treatments differ significantly ($p < 0.05$) and t is referred to values between 0.05 and 0.100 ($0.05 < t < 0.10$); ^aSEM = standard error mean; $p = p$ value.