**Animal**

**Effects of L-carnitine in the distillers dried grains with solubles diet of sows on reproductive performance, milk composition and** **antioxidant status of sows and their offspring**

Bingdong Wei, Qingwei Meng, Shiqi He, Zhe Qu, Shaoping Nie, Baoming Shiand Anshan Shan

**Supplementary Table S1** Analyzed nutrient composition of maize distillers dried grains with solubles (DDGS) fed to sows.

|  |  |
| --- | --- |
| Items | DDGS |
| Chemical composition (%) |  |
| DM | 90.00 |
| CP | 29.57 |
| EE | 10.04 |
| NDF | 27.61 |
| ADF | 12.26 |
| P | 0.61 |
| Fatty acid (g/100g total lipid) |  |
| 16:0 | 12.64 |
| 16:1 | 0.14 |
| 18:0 | 2.17 |
| 18:1 | 27.29 |
| 18:2n-6 | 52.52 |
| 18:n-3 | 1.40 |
| 20:0 | 0.57 |
| Total SFA a | 15.38 |
| Total MUFA b | 28.31 |
| Total PUFA c | 53.92 |
| UFA:SFA d | 5.35 |
| PUFA:SFA e | 3.51 |
| IV (g/100g) f | 118.23 |
| TBARS (ng MDA Eq/mg oil) | 2.0 |

EE, ether extract; SFA, saturated fatty acid; MUFA, monounsaturated fatty acid; PUFA, polyunsaturated fatty acid; UFA, unsaturated fatty acid; IV, iodine value; TBARS, thiobarbituric acid reactive substances; MDA, malondialdehyde.

a Total SFA=([C8:0] + [C10:0] + [C12:0] + [C14:0] + [C16:0] + [C17:0] + [C18:0] + [C20:0] + [C22:0] + [C24:0]); brackets indicate concentration.

b Total MUFA=([C14:1] + [C16:1] + [C18:1] + [C18:1n-7] + [C20:1] + [C24:1]); brackets indicate concentration.

c Total PUFA=([C18:2n-6] + [C18:3n-3] + [C18:n-6] + [C20:2] + [C20:4n-6]); brackets indicate concentration.

d UFA: SFA ratio=[total MUFA + total PUFA]/ total SFA

e PUFA:SFA ratio=total PUFA/ total SFA

f Calculated as iodine value=[C16:1]×0.95+[C18:1] ×0.86+[C18:2] ×1.732+[C18:3] ×2.616+[C20:1] ×0.785+[C22:1] ×0.723; brackets indicate concentration.

**Supplementary Table S2** Composition and nutrient levels of experimental diets fed gestating and lactating sows (as-fed basis).

|  |  |  |
| --- | --- | --- |
| Item | Gestation | Lactation |
| No DDGS | DDGS  | No DDGS | DDGS  |
| No LC | LC | No LC | LC | No LC | LC | No LC | LC |
| Ingredient (g/kg) |  |  |  |  |  |  |  |  |
| Corn grain | 624.0 | 624.0 | 541.5 | 541.5 | 635.0 | 635.0 | 497.5 | 497.5 |
| Soybean meal (430.4 g CP/kg) | 160.0 | 160.0 | — | — | 278.0 | 278.0 | — | — |
| Wheat bran | 180.0 | 180.0 | 170.0 | 170.0 | — | — | — | — |
| Maize DDGS (295.7 g CP/kg) | — | — | 250.0 | 250.0 | — | — | 400.0 | 400.0 |
| Corn gluten meal (635.0 g CP/kg) | — | — | — | — | 25.0 | 25.0 | 35.0 | 35.0 |
| Soybean oil | — | — | — | — | 20.0 | 20.0 | 20.0 | 20.0 |
| L-Lysine.HCl (980.0 g/kg) | — | — | 3.5 | 3.5 | 0.5 | 0.5 | 7.0 | 7.0 |
| L-Tryptophan | — | — | — | — | — | — | 0.5 | 0.5 |
| Limestone | 10.0 | 10.0 | 11.0 | 11.0 | 9.3 | 9.3 | 12.0 | 12.0 |
| Calcium phosphate | 11.0 | 11.0 | 9.0 | 9.0 | 17.2 | 17.2 | 13.0 | 13.0 |
| Salt | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Vitamin and mineral premix a | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| L- carnitine | — | 0.1 | — | 0.1 | — | 0.2 | — | 0.2 |
| Chemical composition (g/kg) b |  |  |  |  |  |  |  |  |
| Crude protein | 145.7 | 145.7 | 145.4 | 145.4 | 185.4 | 185.4 | 184.5 | 184.5 |
| Metabolizable energy (MJ/kg) c | 12.2 | 12.2 | 12.2 | 12.2 | 13.0 | 13.0 | 13.0 | 13.0 |
| Crude fat | 31.9 | 31.9 | 50.7 | 50.7 | 48.5 | 48.5 | 79.1 | 79.1 |
| Neutral detergent fibre | 169.5 | 169.5 | 203.0 | 203.0 | 123.1 | 123.1 | 178.7 | 178.7 |
| Acid detergent fibre | 55.1 | 55.1 | 66.9 | 66.9 | 45.3 | 45.3 | 64.4 | 64.4 |
| Calcium | 6.9 | 6.9 | 7.0 | 7.0 | 8.2 | 8.2 | 8.2 | 8.2 |
| Total phosphorus | 6.2 | 6.2 | 6.1 | 6.1 | 6.4 | 6.4 | 6.1 | 6.1 |
| Lysine c | 6.6 | 6.6 | 6.5 | 6.5 | 9.4 | 9.4 | 9.4 | 9.4 |
| Tryptophan c | 1.6 | 1.6 | 1.2 | 1.2 | 2.0 | 2.0 | 1.7 | 1.7 |
| Threonine c | 5.2 | 5.2 | 4.7 | 4.7 | 6.8 | 6.8 | 6.1 | 6.1 |
| Methionine+ Cystine c | 4.5 | 4.5 | 4.8 | 4.8 | 5.9 | 5.9 | 6.4 | 6.4 |

DDGS, distillers dried grains with solubles; LC, L-carnitine.

a Provided the following per kilogram of diet:12 000 IU of Vitamin A, 2 500 IU of Vitamin D3, 65.8 IU of Vitamin E, 3.6 mg of Vitamin K, 1.7 mg of thiamin, 7.0 mg of riboflavin, 1.6 mg of pyridoxine, 0.3 mg of Vitamin B12, 35 mg of niacin, 15 mg of pantothenic acid, 3.5 mg of folic acid, 0.4 mg of biotin, 500 mg of choline, 120 mg of Fe as FeSO4.H2O, 21.25 mg of Cu as CuSO4.5H2O, 39.75 mg of Mn as MnSO4.H2O, 101.25 mg of Zn as ZnSO4.H2O, 0.4mg of I as KI.

b Analyzed values.

c Calculated values.

**Supplementary Table S3** Composition and nutrient levels of diets for nursery and growing-finishing pigs (as-fed basis).

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Nursery period | Growing period | Fattening period |
| 5-10kg | 10-25 kg | 25-45kg | 45-60kg | 60-110kg |
| Ingredients (g/kg) |  |  |  |  |  |
| Corn | 534.3 | 599.1 | 591.6 | 654.5 | 693.5 |
| Soybean meal (430.4 CP g/kg) | 250.0 | 260.0 | 230.0 | 250.0 | 200.0 |
| Fish meal (660.0 CP g/kg) | 50.0 | 50.0 | 50.0 | — | — |
| Soybean oil | 50.0 | 50.0 | 50.0 | 20.0 | 20.0 |
| Full-fat soybean | 70 | — | — | — | — |
| Wheat bran | — | — | 50.0 | 50.0 | 60.0 |
| Limestone | 8.0 | 9.0 | 8.5 | 8.0 | 7.5 |
| Calcium phosphate | 17.0 | 14.5 | 9.0 | 8.0 | 9.5 |
| Salt | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Choline chloride (500.0 g/kg) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Vitamin and mineral premix a | 5.0 | 5.0 | — | — | — |
| Vitamin and mineral premix b | — | — | 5.0 | — | — |
| Vitamin and mineral premix c | — | — |  | 5.0 | 5.0 |
| L-Lysine-HCl (980.0 g/kg) | 3.0 | 1.5 | 0.7 | — | — |
| DL-Methionine (990.0g/kg) | 1.4 | 0.6 | 0.4 | — | — |
| L-Threonine (990.0 g/kg) | 1.0 | — | — | — | — |
| Tiamulin (22 g/kg) | 1.8 | 1.8 | — | — | — |
| Chlortetracycline (110g/kg) | 4.0 | 4.0 | 0.3 | — | — |
| Chemical composition (g/kg) d |  |  |  |  |  |
| Crude protein | 213.2 | 194.6 | 185.1 | 164.4 | 147.6 |
| Metabolizable energy (MJ/kg) e | 13.7 | 13.6 | 13.6 | 13.1 | 13.0 |
| Crude fat | 90.4 | 79.7 | 81.4 | 49.6 | 50.1 |
| Calcium | 9.7 | 9.4 | 7.9 | 5.7 | 5.7 |
| Total phosphorus | 7.5 | 7.1 | 6.4 | 5.1 | 5.2 |
| Lysine e | 14.5 | 12.1 | 10.7 | 8.2 | 7.1 |
| Tryptophan e | 2.5 | 2.2 | 2.1 | 1.9 | 1.6 |
| Threonine e | 9.3 | 7.6 | 7.1 | 6.2 | 5.5 |
| Methionine e | 4.9 | 3.9 | 3.5 | 2.5 | 2.2 |

a Provided the following per kilogram of diet: 11 023 IU of Vitamin A, 2 756 IU of Vitamin D3, 66 IU of Vitamin E, 4.4 mg of Vitamin K, 1.1 mg of thiamin, 9.9 mg of riboflavin, 2.2 mg of pyridoxine, 0.1 mg of Vitamin B12, 55 mg of niacin, 55 mg of pantothenic acid, 1.7 mg of folic acid, 0.4 mg of biotin, 0.33 mg of antioxidant, 105 mg of Fe as FeSO4.H2O, 6 mg of Cu as CuSO4.5H2O, 28.62 mg of Mn as MnSO4.H2O, 110.06 mg of Zn as ZnSO4.H2O, 0.3 mg of Se as Na2SeO3, 0.14mg of I as KI

b Provided the following per kilogram of diet: 8 818 IU of Vitamin A, 1 653 IU of Vitamin D3, 33 IU of Vitamin E, 3.3 mg of Vitamin K, 1.1 mg of thiamin, 5.5 mg of riboflavin, 2.0 mg of pyridoxine, 0.03 mg of Vitamin B12, 33 mg of niacin, 22 mg of pantothenic acid, 1.0 mg of folic acid, 0.1 mg of biotin, 0.33 mg of antioxidant, 114 mg of Fe as FeSO4.H2O, 6 mg of Cu as CuSO4.5H2O, 14.31 mg of Mn as MnSO4.H2O, 70 mg of Zn as ZnSO4.H2O, 0.3 mg of Se as Na2SeO3, 0.14 mg of I as KI

c Provided the following per kilogram of diet: 8 818 IU of Vitamin A, 1 653 IU of Vitamin D3, 33 IU of Vitamin E, 3.3 mg of Vitamin K, 1.1 mg of thiamin, 5.5 mg of riboflavin, 2.0 mg of pyridoxine, 0.03 mg of Vitamin B12, 33 mg of niacin, 22 mg of pantothenic acid, 1.0 mg of folic acid, 0.1 mg of biotin, 90 mg of Fe as FeSO4.H2O, 5 mg of Cu as CuSO4.5H2O, 14.31 mg of Mn as MnSO4.H2O, 69 mg of Zn as ZnSO4.H2O, 0.3 mg of Se as Na2SeO3, 0.14 mg of I as KI.

d Analyzed values.

e Calculated values.