The effect of Piétrain sire on the performance of the progeny of two commercial dam breeds: a pig intervention study

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**Table S1** Ingredient composition of the pig diets

|  |  |  |  |
| --- | --- | --- | --- |
|  | Grower  diet (%) | Early finisher  diet (%) | Late finisher  diet (%) |
| Wheat | 22.32 | 7.93 | 25.79 |
| Corn | 20.00 | 25.00 | 17.33 |
| Barley | 19.86 | 25.00 | 25.00 |
| Sodium bicarbonate | - | - | 0.10 |
| Soybean meal | 16.24 | 16.54 | 12.21 |
| Beet molasses | 3.00 | 3.00 | 3.00 |
| Rapeseed meal | 5.00 | 1.14 | 1.31 |
| Beet pulp | 0.71 | 5.00 | 6.00 |
| Palm kernel cake | 3.00 | 0.32 | 5.00 |
| Wheat gluten feed | 3.67 | 9.25 | 0.29 |
| Wheat middlings | - | 0.34 | - |
| Sodium chloride | 0.30 | 0.30 | 0.40 |
| Lard | 2.45 | 1.91 | 0.75 |
| Limestone | 1.23 | 1.04 | 0.90 |
| Monocalcium phosphate | 0.28 | 0.14 | 0.10 |
| L-Lysine HCL, 78% | 0.50 | 0.52 | 0.44 |
| L-Threonine, 98% | 0.19 | 0.22 | 0.18 |
| DL-Methionine, 99% | 0.16 | 0.20 | 0.13 |
| L-Valine, 96.5% | 0.05 | 0.08 | 0.05 |
| L-Tryptophan, 98% | 0.03 | 0.03 | 0.02 |
| L-Isoleucine | - | 0.03 | - |
| Celite | - | 1.00 | - |
| Natuphos | 0.01 | 0.01 | 0.01 |
| Premix1 | 1.00 | 1.00 | 1.00 |

1The premix contains (per kilogram of mixture): vitamin A, 1 200 000 IU; vitamin D3, 200 000 IU; vitamin E, 7.5 g; vitamin K, 101 mg; vitamin B1, 150 mg; vitamin B2, 0.5 g; vitamin B5, 1.8 g; vitamin B6, 0.4 g; vitamin B12, 3 mg; vitamin B3, 2.5 g; choline, 43.25 g; folic acid, 300 mg; biotin, 30.0 mg; ethoxyquin, 55 mg; butylated hydroxytoluene, 50 mg; Ca, 88.854 g; Mg, 16.44 g; Fe, 15.0 g; Cu, 1.5 g; Mn, 5.0 g; Zn, 10 g; I, 0.2 g; Se, 0.04 g.

**Table S2** Formulated nutrient composition of the pig diets1

|  |  |  |  |
| --- | --- | --- | --- |
|  | Grower  diet (g/kg) | Early finisher  diet (g/kg) | Late finisher  diet (g/kg) |
| Dry matter | 887.9 | 890.0 | 884.9 |
| Crude ash | 51.4 | 59.5 | 46.5 |
| Crude fiber | 43.0 | 45.0 | 50.0 |
| Crude protein | 180.0 | 170.0 | 155.0 |
| Ether extract | 48.8 | 43.9 | 30.1 |
| ADF | 63.6 | 59.9 | 71.7 |
| NDF | 145.3 | 147.7 | 161.5 |
| ADL | 11.6 | 8.6 | 12.5 |
| Calcium | 7.5 | 6.6 | 6.0 |
| Phosphorus | 4.7 | 4.3 | 3.7 |
| Digestible phosphorus | 2.5 | 2.2 | 2.0 |
| AID2 Lysine | 10.2 | 10.0 | 8.4 |
| AID Methionine + Cysteine | 6.0 | 5.9 | 4.9 |
| AID Methionine | 3.7 | 3.8 | 3.0 |
| AID Threonine | 6.2 | 6.2 | 5.2 |
| AID Tryptophan | 1.9 | 1.9 | 1.5 |
| AID Isoleucine | 5.3 | 5.2 | 4.4 |
| AID Leucine | 10.4 | 10.0 | 8.7 |
| AID Valine | 6.5 | 6.4 | 5.4 |
| AID Arginine | 8.8 | 8.1 | 7.3 |
| AID Histidine | 3.4 | 3.2 | 2.8 |
| AID Phenylalanine | 6.5 | 6.1 | 5.5 |
| NE2, MJ/kg | 9.7 | 9.5 | 9.4 |

1According to CBV (2007)

2AID = Apparent ileal digestibility, NE = net energy

**Table S3** Effect of pig sire (S) and dam breed (D) on growth performance of their offspring, per feeding phase and during the whole growing-finishing period (means)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | Sire | | | | | | |  | *P*-value1 | | | | | |
|  |  |  | 1 | 2 | 3 | 4 | 5 | 62 |  | | |  | Dam breed | |  | |
|  | Phase | Dam | P0Q03 | P-Q++ | P++Q- | P+Q++ | P++Q+ | P++Q+ | SEM3 | | | Sire | S x D | |
| Number of pens (*n*) (A|B) |  |  | 5|6 | 6|6 | 6|6 | 6|6 | 3|3 | 3|3 |  | | |  |  | |  | |
| DFI3 (kg)4 | 20 - 40 | A | 1.16 | 1.15 | 1.22 | 1.21 | 1.25 | 1.05 | 0.01 | | |  |  | |  | |
|  |  | B | 1.22 | 1.17 | 1.19 | 1.26 | 1.32 | 1.11 | 0.02 | | |  |  | |  | |
|  | 40 - 70 | A | 1.85 | 1.81 | 1.92 | 1.92 | 1.94 | 1.61 | 0.03 | | |  |  | |  | |
|  |  | B | 1.95 | 1.80 | 1.84 | 1.93 | 1.96 | 1.82 | 0.03 | | |  |  | |  | |
|  | 70 - 110 | A | 2.43 | 2.31 | 2.55 | 2.60 | 2.69 | 2.53 | 0.04 | | |  |  | |  | |
|  |  | B | 2.56 | 2.41 | 2.43 | 2.49 | 2.59 | 2.54 | 0.03 | | |  |  | |  | |
|  | 20 - 110 | A | 1.90 | 1.83 | 1.96 | 1.95 | 2.08 | 1.77 | 0.02 | | | <0.001 | 0.650 | | 0.087 | |
|  |  | B | 2.02 | 1.89 | 1.93 | 1.98 | 2.07 | 1.89 | 0.02 | | |  |  | |  | |
| DG3 (kg)4 | 20 - 40 | A | 0.71 | 0.67 | 0.75 | 0.71 | 0.77 | 0.63 | 0.01 | | |  |  | |  | |
|  |  | B | 0.72 | 0.66 | 0.69 | 0.75 | 0.75 | 0.63 | 0.02 | | |  |  | |  | |
|  | 40 - 70 | A | 0.90 | 0.84 | 0.91 | 0.92 | 0.98 | 0.82 | 0.01 | | |  |  | |  | |
|  |  | B | 0.86 | 0.77 | 0.80 | 0.84 | 0.88 | 0.83 | 0.01 | | |  |  | |  | |
|  | 70 - 110 | A | 0.89 | 0.78 | 0.91 | 0.94 | 0.94 | 0.93 | 0.02 | | |  |  | |  | |
|  |  | B | 0.87 | 0.77 | 0.82 | 0.82 | 0.84 | 0.88 | 0.01 | | |  |  | |  | |
|  | 20 - 110 | A | 0.84 | 0.76 | 0.86 | 0.86 | 0.91 | 0.80 | 0.01 | | | <0.001 | 0.849 | | (0.241)5 | |
|  |  | B | 0.83 | 0.74 | 0.78 | 0.79 | 0.83 | 0.78 | 0.01 | | |  |  | |  | |
| DLMG3 (kg)6 | 20 - 110 | A | 0.40 | 0.39 | 0.42 | 0.41 | 0.45 | 0.40 | 0.00 | | | 0.031 | <0.001 | | (0.603)5 | |
|  |  | B | 0.37 | 0.36 | 0.39 | 0.38 | 0.38 | 0.38 | 0.01 | | |  |  | |  | |
| FCR3 (kg/kg)4 | 20 - 40 | A | 1.65 | 1.73 | 1.63 | 1.71 | 1.62 | 1.68 | 0.01 | | |  |  | |  | |
|  |  | B | 1.70 | 1.78 | 1.72 | 1.71 | 1.76 | 1.77 | 0.02 | | |  |  | |  | |
|  | 40 - 70 | A | 2.05 | 2.17 | 2.11 | 2.10 | 1.97 | 1.97 | 0.02 | | |  |  | |  | |
|  |  | B | 2.26 | 2.35 | 2.29 | 2.30 | 2.22 | 2.20 | 0.02 | | |  |  | |  | |
|  | 70 - 110 | A | 2.75 | 2.97 | 2.80 | 2.79 | 2.86 | 2.71 | 0.03 | | |  |  | |  | |
|  |  | B | 2.98 | 3.11 | 2.99 | 3.02 | 3.08 | 2.88 | 0.04 | | |  |  | |  | |
|  | 20 - 110 | A | 2.27 | 2.41 | 2.28 | 2.28 | 2.29 | 2.22 | 0.02 | | | 0.002 | 0.063 | | (0.974)5 | |
|  |  | B | 2.45 | 2.56 | 2.48 | 2.52 | 2.51 | 2.41 | 0.02 | | |  |  | |  | |
| Lysine lean gain (g/kg)4 | 20 - 110 | A | 41.81 | 43.68 | 42.13 | 45.37 | 40.93 | 42.05 | 0.59 | | | 0.176 | <0.001 | | (0.539)5 | |
|  |  | B | 51.72 | 47.44 | 49.90 | 47.06 | 45.78 | 43.60 | 0.90 | | |  | |  | |  |

1Performance parameters (DFI, DG, and FCR) were analyzed using a longitudinal model that included feeding phase as a fixed factor

2In the second round, sire 5 was replaced by sire 6

3P = growth performance, Q = carcass quality, - = poor, 0 = average, + = moderate, ++ = good, DFI = daily feed intake, DG = daily gain, FCR = feed conversion ratio, DLMG = daily lean meat gain, SEM = standard error of mean of all sires within one dam breed

4Measured at pen level

5Interaction was not included in statistical model if *P* > 0.1, *P*-values of the excluded interactions in initial models are shown in brackets

6Measured at animal level (*n* x 6)

**Table S4** *Pig dam breed mean values ± SEM*1 *of all parameters studied*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | | Dam breed | |
|  |  | A | | B |
| DG1 (g) | Mean | 829.8 | | 785.8 |
|  | SEM | 12.6 | | 10.5 |
| DFI1 (kg) | Mean | 1.8 | | 1.9 |
|  | SEM | 0.1 | | 0.1 |
| FCR1 (kg/kg) | Mean | 2.2 | | 2.3 |
|  | SEM | 0.1 | | 0.1 |
| Lysine lean gain (g/kg) | Mean | 42.9 | | 48.2 |
|  | SEM | 0.6 | | 0.9 |
| DLMG1 (g) | Mean | 411.0 | | 375.3 |
|  | SEM | 3.7 | | 5.4 |
| Lean meat (%) | Mean | 63.8 | | 62.4 |
|  | SEM | 0.2 | | 0.3 |
| Fat thickness (mm) | Mean | 8.0 | | 9.6 |
|  | SEM | 0.2 | | 0.2 |
| Muscle thickness (mm) | Mean | 64.7 | | 65.0 |
|  | SEM | 0.4 | | 0.4 |
| Relative weight ham (%) | Mean | 23.4 | | 23.4 |
|  | SEM | 0.1 | | 0.1 |
| Relative weight loin (%) | Mean | 27.5 | | 27.3 |
|  | SEM | 0.1 | | 0.1 |
| Relative weight shoulder (%) | Mean | 15.8 | | 15.7 |
|  | SEM | 0.0 | | 0.0 |
| Relative weight belly (%) | Mean | 15.1 | | 15.4 |
|  | SEM | 0.0 | | 0.1 |
| Dressing percentage (%) | Mean | 78.9 | | 78.1 |
|  | SEM | 0.1 | | 0.7 |
| Cold carcass weight (kg) | Mean | 90.4 | | 90.4 |
|  | SEM | 0.6 | | 0.6 |
| Slaughter weight (kg) | Mean | 114.6 | | 114.5 |
|  | SEM | 0.7 | | 0.7 |
| Creatinine (mg/dL) | Mean | 1.6 | | 1.5 |
|  | SEM | 0.0 | | 0.0 |
| Urea (mg/dL) | Mean | 21.0 | | 23.0 |
|  | SEM | 0.6 | | 0.6 |
| pH451 | Mean | 6.3 | | 6.3 |
|  | SEM | 0.0 | | 0.0 |
| pHu1 | Mean | 5.5 | | 5.5 |
|  | SEM | 0.0 | | 0.0 |
| *L* (lightness) | Mean | 57.3 | | 55.9 |
|  | SEM | 0.3 | | 0.4 |
| *a* (redness) | Mean | 7.4 | | 7.9 |
|  | SEM | 0.1 | | 0.2 |
| *b* (yellowness) | Mean | 16.4 | | 16.3 |
|  | SEM | 0.1 | | 0.1 |
| Drip loss (%) | Mean | 7.8 | | 6.7 |
|  | SEM | 0.2 | | 0.2 |
| Cooking loss (%) | Mean | 0.3 | | 0.3 |
|  | SEM | 0.0 | | 0.0 |
| IMF1 (%) | Mean | 1.5 | | 1.5 |
|  | SEM | 0.0 | | 0.0 |
| Shear force (*n*) | Mean | 36.9 | | 39.8 |
|  | SEM | 0.5 | | 0.6 |

1DFI = daily feed intake, DG = daily gain, FCR = feed conversion ratio, DLMG = daily lean meat gain, pH45 = pH 45 min *post mortem*, pHu = ultimate pH, IMF = intramuscular fat, SEM = standard error of mean of all sires per dam breed

**Table S5** *Pig* *sire mean values ± SEM*1 *of all parameters studied*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | Sire | | | | | |
|  |  | 1 | | 2 | 3 | 4 | 5 | 6 |
| DG1 (g) | Mean | 824.6 | | 746.8 | 814.3 | 828.1 | 862.3 | 787.5 |
|  | SEM | 19.2 | | 13.5 | 17.0 | 18.7 | 22.3 | 33.5 |
| DFI1 (kg) | Mean | 1.9 | | 1.8 | 1.9 | 1.9 | 2.0 | 1.8 |
|  | SEM | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 |
| FCR1 (kg/kg) | Mean | 2.2 | | 2.4 | 2.3 | 2.3 | 2.3 | 2.2 |
|  | SEM | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Lysine lean gain (g/kg) | Mean | 47.2 | | 45.6 | 46.0 | 46.2 | 43.4 | 42.8 |
|  | SEM | 2.2 | | 1.0 | 1.4 | 1.3 | 1.2 | 1.4 |
| DLMG1 (kg) | Mean | 386.3 | | 377.9 | 404.5 | 393.4 | 413.7 | 390.2 |
|  | SEM | 11.5 | | 7.7 | 4.4 | 4.0 | 15.8 | 6.1 |
| Lean meat (%) | Mean | 62.1 | | 64.9 | 63.0 | 62.4 | 62.9 | 63.4 |
|  | SEM | 0.4 | | 0.3 | 0.3 | 0.4 | 0.5 | 0.5 |
| Fat thickness (mm) | Mean | 9.6 | | 7.6 | 9.3 | 8.9 | 9.2 | 8.3 |
|  | SEM | 0.4 | | 0.3 | 0.4 | 0.3 | 0.5 | 0.5 |
| Muscle thickness (mm) | Mean | 63.2 | | 67.8 | 66.4 | 62.1 | 65.8 | 63.3 |
|  | SEM | 0.6 | | 0.5 | 0.6 | 0.6 | 0.8 | 0.6 |
| Relative weight ham (%) | Mean | 23.2 | | 23.8 | 23.5 | 23.1 | 23.3 | 23.3 |
|  | SEM | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Relative weight loin (%) | Mean | 26.9 | | 28.3 | 27.4 | 26.9 | 27.5 | 27.2 |
|  | SEM | 0.1 | | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| Relative weight shoulder (%) | Mean | 15.7 | | 15.9 | 15.8 | 15.7 | 15.8 | 15.8 |
|  | SEM | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Relative weight belly (%) | Mean | 15.4 | | 14.9 | 15.3 | 15.3 | 15.3 | 15.1 |
|  | SEM | 0.1 | | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Dressing percentage (%) | Mean | 77.6 | | 79.4 | 79.2 | 78.3 | 76.9 | 79.2 |
|  | SEM | 1.2 | | 0.1 | 0.2 | 0.1 | 2.2 | 0.2 |
| Cold carcass weight (kg) | Mean | 90.2 | | 89.7 | 91.1 | 89.9 | 91.0 | 91.6 |
|  | SEM | 1.0 | | 0.8 | 1.0 | 1.0 | 1.4 | 1.2 |
| Slaughter weight (kg) | Mean | 114.4 | | 113.0 | 115.0 | 114.8 | 115.3 | 115.7 |
|  | SEM | 1.2 | | 1.1 | 1.2 | 1.2 | 1.7 | 1.4 |
| Creatinine (mg/dL) | Mean | 1.5 | | 1.5 | 1.6 | 1.4 | - | 1.6 |
|  | SEM | 0.1 | | 0.0 | 0.0 | 0.0 | - | 0.1 |
| Urea (mg/dL) | Mean | 24.3 | | 18.5 | 22.9 | 21.1 | - | 23.9 |
|  | SEM | 0.9 | | 0.9 | 1.1 | 0.7 | - | 0.8 |
| pH451 | Mean | 6.3 | | 6.3 | 6.3 | 6.3 | 6.2 | - |
|  | SEM | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | - |
| pHu1 | Mean | 5.5 | | 5.5 | 5.5 | 5.5 | 5.4 | - |
|  | SEM | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | - |
| *L* (lightness) | Mean | 55.7 | | 55.5 | 57.2 | 56.9 | 57.7 | - |
|  | SEM | 0.6 | | 0.6 | 0.5 | 0.6 | 0.4 | - |
| *a* (redness) | Mean | 8.2 | | 8.5 | 6.8 | 7.2 | 7.5 | - |
|  | SEM | 0.2 | | 0.3 | 0.2 | 0.2 | 0.2 | - |
| *b* (yellowness) | Mean | 16.5 | | 16.8 | 15.9 | 16.2 | 16.4 | - |
|  | SEM | 0.1 | | 0.2 | 0.1 | 0.2 | 0.1 | - |
| Drip loss (%) | Mean | 7.7 | | 7.3 | 6.7 | 7.2 | 7.5 | - |
|  | SEM | 0.4 | | 0.3 | 0.3 | 0.3 | 0.2 | - |
| Cooking loss (%) | Mean | 0.3 | | 0.3 | 0.3 | 0.3 | 0.3 | - |
|  | SEM | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | - |
| IMF1 (%) | Mean | 1.5 | | 1.4 | 1.5 | 1.7 | 1.5 | - |
|  | SEM | 0.0 | | 0.1 | 0.1 | 0.1 | 0.0 | - |
| Shear force (*n*) | Mean | 37.1 | | 37.9 | 40.3 | 39.5 | 36.8 | - |
|  | SEM | 0.8 | | 0.7 | 0.9 | 0.9 | 0.8 | - |

1DFI = daily feed intake, DG = daily gain, FCR = feed conversion ratio, DLMG = daily lean meat gain, pH45 = pH 45 min *post mortem*, pHu = ultimate pH, IMF = intramuscular fat, SEM = standard error of mean of both dam breeds per sire